



United Nations

FCCC/ARR/2019/ESP



Framework Convention on  
Climate Change

Distr.: General  
20 March 2020

English only

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## Report on the individual review of the annual submission of Spain submitted in 2019\*

Note by the expert review team

### *Summary*

Each Party included in Annex I to the Convention must submit an annual inventory of emissions and removals of greenhouse gases for all years from the base year (or period) to two years before the inventory due date (decision 24/CP.19). Parties included in Annex I to the Convention that are Parties to the Kyoto Protocol are also required to report supplementary information under Article 7, paragraph 1, of the Kyoto Protocol with the inventory submission due under the Convention. This report presents the results of the individual inventory review of the 2019 annual submission of Spain, conducted by an expert review team in accordance with the “Guidelines for review under Article 8 of the Kyoto Protocol”. The review took place from 16 to 21 September 2019 in Bonn.


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\* In the symbol for this document, 2019 refers to the year in which the inventory was submitted, not to the year of publication.

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## Abbreviations and acronyms

2006 IPCC Guidelines	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i>
2016 EMEP/EEA guidebook	<i>EMEP/EEA air pollutant emission inventory guidebook 2016</i>
AAU	assigned amount unit
AD	activity data
ANCADE	Spanish National Association of Lime and Lime Derivatives Manufacturers
Annex A source	source category included in Annex A to the Kyoto Protocol
AR	afforestation and reforestation
Article 8 review guidelines	“Guidelines for review under Article 8 of the Kyoto Protocol”
C <sub>2</sub> F <sub>6</sub>	hexafluoroethane
CAP	Common Agricultural Policy of the European Union
CER	certified emission reduction
CF <sub>4</sub>	tetrafluoromethane
CH <sub>4</sub>	methane
CM	cropland management
Convention reporting adherence	adherence to the “Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
COPERT	software tool for estimating road transport emissions
CORINE	Coordination of Information on the Environment
CO <sub>2</sub>	carbon dioxide
CO <sub>2</sub> eq	carbon dioxide equivalent
CP	commitment period
CPR	commitment period reserve
CRF	common reporting format
DOC	degradable organic carbon
EF	emission factor
EMEP/EEA	European Monitoring and Evaluation Programme/European Environment Agency
ERT	expert review team
ERU	emission reduction unit
ESYRCE	Spanish crop surface area and yield survey
EU	European Union
EU ETS	European Union Emissions Trading System
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAOSTAT	statistical database of the Food and Agriculture Organization of the United Nations
F-gas	fluorinated gas
F <sub>IND-COM</sub>	factor for industrial and commercial co-discharged protein into the sewer system
FM	forest management
FMRL	forest management reference level
GHG	greenhouse gas
GM	grazing land management
HFC	hydrofluorocarbon
HWP	harvested wood products
ICP Forests	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests

IE	included elsewhere
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
IPCC good practice guidance for LULUCF	<i>Good Practice Guidance for Land Use, Land-Use Change and Forestry</i>
IPPU	industrial processes and product use
KP-LULUCF activities	activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
KP reporting adherence	adherence to the reporting guidelines under Article 7, paragraph 1, of the Kyoto Protocol
Kyoto Protocol Supplement	<i>2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol</i>
LULUCF	land use, land-use change and forestry
MCA	map of crops and land use
MCF	methane conversion factor
MFE	national forestry map of Spain
MFE50	national forestry map of Spain 1:50,000
MMS	manure management system(s)
N	nitrogen
N <sub>2</sub> O	nitrous oxide
NA	not applicable
NE	not estimated
NF <sub>3</sub>	nitrogen trifluoride
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
PFC	perfluorocarbon
QA/QC	quality assurance/quality control
RMU	removal unit
RV	revegetation
SEF	standard electronic format
SF <sub>6</sub>	sulfur hexafluoride
SOC	soil organic carbon
UNFCCC Annex I inventory reporting guidelines	“Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories”
UNFCCC review guidelines	“Guidelines for the technical review of information reported under the Convention related to greenhouse gas inventories, biennial reports and national communications by Parties included in Annex I to the Convention”
WDR	wetland drainage and rewetting
Wetlands Supplement	<i>2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands</i>

## I. Introduction<sup>1</sup>

1. This report covers the review of the 2019 annual submission of Spain organized by the secretariat in accordance with the Article 8 review guidelines (adopted by decision 22/CMP.1 and revised by decision 4/CMP.11). In accordance with the Article 8 review guidelines, this review process also encompasses the review under the Convention as described in the UNFCCC review guidelines, particularly in part III thereof, namely the “UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention” (decision 13/CP.20). The review took place from 16 to 21 September 2019 in Bonn and was coordinated by James Howland, Nashib Kafle and Roman Payo (secretariat). Table 1 provides information on the composition of the ERT that conducted the review of Spain.

Table 1

### Composition of the expert review team that conducted the review of Spain

<i>Area of expertise</i>	<i>Name</i>	<i>Party</i>
Generalist	Riccardo de Lauretis	Italy
	Melissa Weitz	United States of America
Energy	Vincent Camobreco	United States of America
	Sangay Dorji	Bhutan
	Brooke Perkins	Australia
IPPU	Thapelo Letete	South Africa
	Jacek Skoskiewicz	Poland
	Alexander Valencia	Colombia
Agriculture	Fatou Ndeye Gaye	Gambia
	Nidup Peljor	Bhutan
	Andrea Pickering	New Zealand
LULUCF and KP-LULUCF activities	Markus Didion	Switzerland
	Timothy Liersch	Australia
	Marina Vitullo	Italy
Waste	Fatma Betül Demirok	Turkey
	Julius Madzore	Zimbabwe
Lead reviewers	Thapelo Letete	
	Melissa Weitz	

2. The basis of the findings in this report is the assessment by the ERT of the Party’s 2019 annual submission in accordance with the UNFCCC review guidelines and the Article 8 review guidelines. The ERT notes that the individual inventory review of Spain’s 2018 annual submission did not take place in 2018 owing to insufficient funding for the review process.

3. The ERT has made recommendations that Spain resolve the findings related to issues,<sup>2</sup> including issues designated as problems.<sup>3</sup> Other findings, and, if applicable, the encouragements of the ERT to Spain to resolve them, are also included.

<sup>1</sup> At the time of publication of this report, Spain had submitted its instrument of ratification of the Doha Amendment; however, the Amendment had not yet entered into force. The implementation of the provisions of the Doha Amendment is therefore considered in this report in the context of decision 1/CMP.8, para. 6, pending the entry into force of the Amendment.

<sup>2</sup> Issues are defined in decision 13/CP.20, annex, para. 81.

<sup>3</sup> Problems are defined in decision 22/CMP.1, annex, paras. 68–69, as revised by decision 4/CMP.11.

4. A draft version of this report was communicated to the Government of Spain, which provided comments that were considered and incorporated, as appropriate, into this final version of the report.
5. Annex I shows annual GHG emissions for Spain, including totals excluding and including the LULUCF sector, indirect CO<sub>2</sub> emissions, and emissions by gas and by sector. Annex I also contains background data related to emissions and removals from KP-LULUCF activities, if elected by Spain, by gas, sector and activity.
6. Information to be included in the compilation and accounting database can be found in annex II.

## II. Summary and general assessment of the 2019 annual submission

7. Table 2 provides the assessment by the ERT of the annual submission with respect to the tasks undertaken during the review. Further information on the issues identified, as well as additional findings, may be found in tables 3 and 5.

Table 2  
Summary of review results and general assessment of the inventory of Spain

Assessment		Issue or problem ID#(s) in table 3 and/or 5 <sup>a</sup>	
Dates of submission	Original submission: 2 April 2019 (NIR), 2 April 2019 (CRF tables) version 1, 2 April 2019 (SEF-CP1-2018), 10 May 2019 (SEF-CP2-2018)		
Review format	Centralized		
Application of the requirements of the UNFCCC Annex I inventory reporting guidelines and Wetlands Supplement (if applicable)	Have any issues been identified in the following areas:		
	(a) Identification of key categories?	Yes	L.12
	(b) Selection and use of methodologies and assumptions?	No	
	(c) Development and selection of EFs?	Yes	W.1, W.4, E.20
	(d) Collection and selection of AD?	Yes	L.1, L.19, L.20
	(e) Reporting of recalculations?	No	
	(f) Reporting of a consistent time series?	Yes	E.3, W.5
	(g) Reporting of uncertainties, including methodologies?	Yes	G.6, W.2
	(h) QA/QC?		QA/QC procedures were assessed in the context of the national system (see supplementary information under the Kyoto Protocol below)
	(i) Missing categories/completeness? <sup>b</sup>	Yes	L.11, L.14
	(j) Application of corrections to the inventory?	No	
Significance threshold	For categories reported as insignificant, has the Party provided sufficient information showing that the likely level of emissions meets the criteria in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines?	Yes	
Description of trends	Did the ERT conclude that the description in the NIR of the trends for the different gases and sectors is reasonable?	No	I.9, L.17, KL.4
Supplementary information under	Have any issues been identified related to the following aspects of the national system:		

Assessment			<i>Issue or problem ID#(s) in table 3 and/or 5<sup>a</sup></i>
the Kyoto Protocol	(a) Overall organization of the national system, including the effectiveness and reliability of the institutional, procedural and legal arrangements?	No	
	(b) Performance of the national system functions?	No	
	Have any issues been identified related to the national registry:		
	(a) Overall functioning of the national registry?	No	
	(b) Performance of the functions of the national registry and the technical standards for data exchange?	No	
	Have any issues been identified related to reporting of information on AAUs, CERs, ERUs and RMUs and on discrepancies reported in accordance with decision 15/CMP.1, annex, chapter I.E, in conjunction with decision 3/CMP.11, taking into consideration any findings or recommendations contained in the standard independent assessment report?	No	
	Have any issues been identified in matters related to Article 3, paragraph 14, of the Kyoto Protocol, specifically problems related to the transparency, completeness or timeliness of reporting on the Party's activities related to the priority actions listed in decision 15/CMP.1, annex, paragraph 24, in conjunction with decision 3/CMP.11, including any changes since the previous annual submission?	No	
	Have any issues been identified related to the following reporting requirements for KP-LULUCF activities:		
	(a) Reporting requirements of decision 2/CMP.8, annex II, paragraphs 1–5?	No	
	(b) Demonstration of methodological consistency between the reference level and reporting on FM in accordance with decision 2/CMP.7, annex, paragraph 14?	No	
(a) Reporting requirements of decision 6/CMP.9?	No		
(b) Country-specific information to support provisions for natural disturbances, in accordance with decision 2/CMP.7, annex, paragraphs 33 and 34?	No		
CPR	Was the CPR reported in accordance with the annex to decision 18/CP.7, the annex to decision 11/CMP.1 and decision 1/CMP.8, paragraph 18?	Yes	
Adjustments	Has the ERT applied an adjustment under Article 5, paragraph 2, of the Kyoto Protocol?	No	
	Did the Party submit a revised estimate to replace a previously applied adjustment?	NA	Spain does not have a previously applied adjustment
Response from the Party during the review	Has the Party provided the ERT with responses to the questions raised, including the data and information necessary for the assessment of conformity with the UNFCCC Annex I inventory reporting guidelines and any further guidance adopted by the Conference of the Parties?	Yes	
Recommendation for an exceptional in-country review	On the basis of the issues identified, does the ERT recommend that the next review be conducted as an in-country review?	No	

<i>Assessment</i>	<i>Issue or problem ID#(s) in table 3 and/or 5<sup>a</sup></i>
Questions of implementation	No

<sup>a</sup> The ERT identified additional issues and/or problems in the general, energy, IPPU, agriculture, LULUCF and waste sectors as well as issues and/or problems related to reporting on KP-LULUCF activities that are not listed in this table but are included in table 5.

<sup>b</sup> Missing categories for which methods are provided in the 2006 IPCC Guidelines may affect completeness and are listed in annex III.

### III. Status of implementation of issues and/or problems raised in the previous review report

8. Table 3 compiles all the recommendations made in previous review reports that were included in the previous review report, published on 24 January 2018.<sup>4</sup> For each issue and/or problem, the ERT specified whether it believes the issue and/or problem has been resolved by the conclusion of the review of the 2019 annual submission and provided the rationale for its determination, which takes into consideration the publication date of the previous review report and national circumstances.

Table 3  
Status of implementation of issues and/or problems raised in the previous review report of Spain

<i>ID#</i>	<i>Issue and/or problem classification<sup>a, b</sup></i>	<i>Recommendation made in previous review report</i>	<i>ERT assessment and rationale</i>
<b>General</b>			
G.1	Follow-up to previous reviews (G.1, 2017) (G.4, 2016) (G.4, 2015) Transparency	Continue to address the transparency issues identified in the previous and current annual review report and provide information on the implementation of the recommendations on transparency in the NIR.	Addressing. Of the transparency issues identified in the review of the 2015 submission that have not been resolved in prior reviews, the Party has resolved ID#s E.1, E.6, E.9, I.5, I.6, I.7, A.2, A.7, W.3 and KL.3 below. It is still addressing ID#s I.9, A.1, A.5 and KL.4 below.
G.2	Key category analysis (G.3, 2017) (G.6, 2016) (G.6, 2015) Comparability	Provide a justification for the level of category disaggregation used as well as the rationale when there is deviation from the level suggested in the 2006 IPCC Guidelines.	Resolved. In the key category analysis, category 2.F has been disaggregated and category 2.A.4 has been aggregated in accordance with the recommendation of the previous ERTs and the 2006 IPCC Guidelines (see NIR annex 1).
G.3	QA/QC and verification (G.4, 2017) Convention reporting adherence	Improve the QC procedure to avoid inconsistent information between the NIR and the CRF tables and to include all the necessary information in the NIR.	Resolved. The Party has reported in its NIR (p.634) that a QC plan regarding the NIR preparation has been developed and applied from 2018 in order to ensure coherence between the NIR and the CRF tables. All issues linked to consistency between the NIR and the CRF tables raised in the 2017 review report (see ID#s I.26, A.19, A.20, KL.12 in that report) have been resolved. Furthermore, a checklist regarding transparency issues identified in the latest review processes has been prepared in order to ensure that all the necessary information is included in the NIR.

<sup>4</sup> FCCC/ARR/2017/ESP. The ERT notes that the report on the individual inventory review of Spain's 2018 annual submission has not been published yet. As a result, the latest previously published annual review report reflects the findings of the review of the Party's 2017 annual submission.



ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
G.4	National registry (G.6, 2017) KP reporting adherence	Include the information on the total quantity of ERUs issued on the basis of Article 6 projects on a publicly accessible website.	Resolved. The information on the total quantity of ERUs issued on the basis of Article 6 projects is contained in the SEF tables (table 2a, subtotal row, addition of ERUs column) (available at <a href="https://ets-registry.webgate.ec.europa.eu/euregistry/ES/public/reports/publicReports.xhtml">https://ets-registry.webgate.ec.europa.eu/euregistry/ES/public/reports/publicReports.xhtml</a> ). Relevant weblinks are included in the NIR (section 12.4).
Energy			
E.1	1. General (energy sector) – all fuels (E.1, 2017) (E.2, 2016) (E.2, 2015) (27, 2014) Transparency	Include the additional information provided during the review, containing disaggregated information on the EFs and plant-specific net calorific values, in the corresponding chapters of the NIR or include the address of the website where this information can be consulted.	Resolved. The Party has included in its NIR (section 3.2.2.2, p.165) a weblink to information on disaggregated plant-level EFs and net calorific values. The Party has also included in its NIR (section 3.3.2.2, p.176) information on EFs used in petroleum refineries.
E.2	1.A Fuel combustion – sectoral approach – all fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.12, 2017) Transparency	Improve transparency regarding the use of the national energy balance in the inventory by: (a) Explaining the application of the full consistency principle for energy use and how consistency is ensured for non-energy use; (b) Describing, at a detailed activity level, the automatic checks carried out by the queries in the database and the procedures to rebalance excessive or missing fuel consumption; (c) Providing a reference in section 3.1.1 of the NIR to the detailed data in annex 2.	Addressing. Spain has progressed on some of the issues that form part of this recommendation, as follows: (a) Resolved. The Party has reported information on how the consistency principle for energy use has been applied in its NIR (section 3.1.1.1, pp.155–156, and annex 2, pp.807–810). In annex 2, the Party demonstrated how total fuel consumption used in the inventory calculations is consistent with total fuel consumption data from national statistics; (b) Addressing. The ERT noted that the issue is still being addressed because the information in the NIR (annex 2, section A2.1.2, pp.809–810) is not entirely clear regarding how the energy consumption data are distributed across sectors. The Party indicated that for sectors where bottom-up questionnaire data cover the entire sector, the preference is to use those bottom-up energy consumption data for those sectors and rebalance other sector energy use to maintain consistency with national top-down energy balance totals. However, it is not clear which sectors and fuels use the bottom-up data and which have been rebalanced; During the review, in response to questions on issue (b), the Party indicated there was a minor reporting misrepresentation in table A2.1 of annex 2 where it is indicated that International Energy Agency data are preferred for liquefied petroleum gas non-energy use when it is actually the inventory bottom-up questionnaire data that are used. The Party stated that this would be corrected in the next NIR. The Party also indicated that the sectors that are rebalanced are not the same for all types of fuels and the decision depends on the completeness of the data from the inventory questionnaires for each fuel and sector. The Party further explained that the following steps are taken in the rebalancing of energy use across fuel types

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
E.3	1.A Fuel combustion – sectoral approach – all fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.13, 2017) Consistency	Develop a method whereby all methodological improvements (methodological refinements for recent years) are applied in the energy balance for previous years of the time series so that a consistent data set is produced. If this is not possible, consider revising the principle of full consistency with the national energy balance at the subcategory level and develop an internally consistent energy balance for previous years of the time series.	<p>and sectors: (1) establishing the differences between the consumption data from the official energy statistics and those registered by the inventory; (2) establishing a correction factor or ratio of the difference between the two values; and (3) applying this correction factor to all the “non-prefixed” sectors to be balanced. The national total consumption from the official energy statistics constitutes the upper bound to this adjustment. The ERT noted that this information on the balancing approach is not included in the NIR. The ERT would consider issue (b) resolved if the Party adjusted table A2.1 as noted and reflected the description of the above-mentioned balancing approach in the discussion in the NIR (annex 2, section A2.1.2, pp.809–810);</p> <p>(c) Resolved. References to the energy balance and annex 2 are provided in the NIR (section 3). Addressing. The Party has reported in its NIR (section 3.1.1.1, p.156) that in recent years there has been greater coherence between Ministry of Energy data and those obtained by the inventory team. Also, the Party reported in annex 2 to the NIR (section A2.1.1, p.808) that it is organizing annual meetings between the Ministry of Energy and the inventory team to maintain consistency between the data used.</p> <p>The ERT noted that the issue is still being addressed because while there is coordination on recent and current data between the Ministry of Energy and the inventory team and there have been recalculations of historical data for the entire time series so there is time-series consistency at the top level, fluctuations and inconsistencies still exist in the historical data at the subcategory level. For example, there is still a considerable change in the consumption of natural gas in category 1.A.1.c between 2005 and 2006.</p> <p>During the review, the Party explained that there is an ongoing process to improve the national energy balance information and its correct adaptation to the national inventory, as stated in the 2019 NIR (improvement plan for category 1.A.1.c, p.191). The ERT understands that the large increase in natural gas energy use and emissions for category 1.A.1.c between 2005 and 2006 is due to a methodological change in the collection of national energy statistics data in 2005, when data for natural gas in the category “Energy Sector - Not elsewhere specified (Energy)” began to be collected. Before that time, natural gas energy use for category 1.A.1.c would have been accounted for in other subsectors under category 1.A.1. In order to help to resolve this issue, the ERT notes that the Party should add a clarification in section 3.4.2.1 of the NIR to indicate whether</p>

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
			time-series consistency is being maintained at the full category 1.A.1 level.
E.4	1.A. Fuel combustion – sectoral approach – gaseous fuels – CO <sub>2</sub> (E.14, 2017) Accuracy	Upgrade the CO <sub>2</sub> EF for natural gas from a default to a country-specific one and implement this EF in the annual submission for all relevant key categories activities.	Resolved. The Party has reported that it now uses a country-specific EF for natural gas in accordance with gas characteristics provided by the Technical Manager of the gas system in Spain in its NIR (section 3.2.2.2, p.165) and CRF tables 1.A(a)s1–4. The country-specific EFs are applied for all relevant key categories.
E.5	1.A.1.b Petroleum refining – other fossil fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.15, 2017) Comparability	Reallocate the waste gas emissions from category 1.A.1.b to 1.B.2.c (venting and flaring), if the Party cannot properly justify alternative uses for this gas, because the waste gas is clearly burned in furnaces for elimination and not for calorific purposes.	Resolved. The Party has confirmed, following consultation with the refinery involved, that the waste gas is used in heating units and therefore correctly reported under category 1.A.1.b in CRF table 1.A(a). The justification is provided in the NIR (section 3.3.2.2, p.3.37).
E.6	1.A.3.b Road transportation – gaseous fuels – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (E.5, 2017) (E.12, 2016) (E.12, 2015) Transparency	Provide in the NIR information on the assumptions used and estimates for gas consumption in road transportation for the period 1997–2005.	Resolved. The Party has reported information on natural gas consumed in road transportation in its NIR (figure 3.8.5, p.226) and CRF table 1.A(a)s3, including for 1997–2005.  Section 3.8.2.1.1 of the NIR (p.226) states that new data have been provided for 2010–2017 on natural gas use in road transport by the Spanish Association of Natural Gas for Mobility. The natural gas use data for 2010 were combined with fleet data (number of natural gas vehicles) from 2009 to determine a consumption figure per vehicle per year that was then applied to the fleet data (number of vehicles) prior to 2009 to obtain natural gas use in road transportation for those prior years.
E.7	1.A.3.b.iv Motorcycles – gasoline – CO <sub>2</sub> (E.16, 2017) Transparency	Correct the lubricant/gasoline ratio in the calculation formula for lubricants in two-stroke engines and explain in the NIR the variations over the time series.	Addressing. The Party has corrected the lubricant/gasoline ratio in its NIR (p.236) and confirmed this during the review; however, the Party has not fully described the variations over the time series. During the review, the Party explained that the variations in the ratio of gasoline and lubricant use in motorcycles over the time series and, in particular, the decrease in lubricant use in recent years are due to the increase in the ratio between four-stroke and two-stroke motorcycles. The ERT would consider this issue resolved if the Party included this type of information in the NIR.
E.8	1.A.3.b.iv Motorcycles – gasoline – CO <sub>2</sub> (E.16, 2017) Comparability	Report AD and emissions for lubricants separately from gasoline (e.g. in the other liquid fuels category) in the CRF tables.	Resolved. Spain reported lubricant AD and emissions separately from gasoline data for motorcycles in its NIR (section 3.8.2.2.2, p.236) and CRF table 1.A(a)s3.
E.9	1.B.1.a Coal mining and handling – solid fuels – CO <sub>2</sub> (E.8, 2017) (E.14, 2016) (E.14, 2015) Transparency	Either provide a web link or submit the study on CH <sub>4</sub> recovery and flaring as an additional file to the next submission.	Resolved. The Party has provided functioning links in its NIR (section 3.15.2.1, p.268) to the websites where the research reports on CH <sub>4</sub> recovery and flaring can be found.
E.10	1.B.2.b Natural gas – distribution – CH <sub>4</sub>	Improve the transparency of reporting by including in the NIR	Resolved. The Party has reported data on gas distribution network length and emissions along

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
	(E.17, 2017) Transparency	a summary of the analysis of the correlation between CH <sub>4</sub> emissions and gas distribution network length, which was provided during the review.	with the IEF based on pipeline length in its NIR (section 3.16.2.1.2.e, p.275). The Party also provided explanations in the NIR of why and how the IEF changes over time in response to changes in pipeline materials.
E.11	1.B.2.c Venting and flaring – liquid fuels – CO <sub>2</sub> (E.18, 2017) Transparency	Correct the description in the NIR of the methodology for flaring in refineries to explain that CO <sub>2</sub> emission estimates from refinery flaring are based on individualized questionnaires that are fully consistent with EU ETS data.	Resolved. The Party has included references to methodology documents in its NIR (sections 3.16.2.1.4 (p.277) and 3.16.2.2.4 (p.279)) describing the approach for calculating emissions from flaring in refineries. The previous reference to a tier 1 approach for this emission category has been updated to reflect the approach applied that bases emission estimates on data that are consistent with EU ETS data.
E.12	1.B.2.c Venting and flaring – gaseous fuels – CO <sub>2</sub> (E.19, 2017) Transparency	Change the unit used in CRF table 1.B.2 and report AD that are more representative of all activities under category 1.B.2.c.2.ii (e.g. AD related to gas burned in flaring) so that trends in the IEF may be linked to a relevant driver of the emissions.	Resolved. The Party has reported CO <sub>2</sub> IEFs that correspond to AD for the two different sources of emissions included in category 1.B.2.c.2.ii calculations in its NIR (section 3.16.2.1.4.b, pp.277–278).  The ERT noted that the issue is resolved because the Party reported in the NIR (figure 3.16.4, p.278) IEFs for the two different sources of emissions included in category 1.B.2.c.2.ii: flaring from production and processing activities, and flaring from regasification plant and underground storage activities. The data in figure 3.16.4 show consistent IEFs over time for the individual sources and explain how the fluctuation in IEFs reported for the total is due to fluctuations in contributions of the two different sources to the overall category emissions. The figure documents the two individual source IEFs and the contribution of each to the totals. Furthermore, the AD in CRF table 1.B.2 have been updated to reflect the AD used in calculating emissions from the two flare sources.
IPPU			
I.1	2. General (IPPU) (I.21, 2017) Transparency	Transparently report in the NIR recalculations for the IPPU sector, including explanations of considerations and rationale.	Resolved. The Party has reported recalculations for the IPPU sector in its NIR (chap. 4) and included detailed explanations of improvements and recalculations for key IPPU categories as follows: section 4.2.5 (p.300) for category 2.A.1; section 4.3.5 (p.304) for category 2.A.2; section 4.5.5 (p.311) for category 2.A.4; section 4.7.5 (p.316) for category 2.B.2; section 4.12.5 (p.324) for category 2.B.8; section 4.13.5 (p.328) for category 2.B.9; section 4.14.5 (p.331) for category 2.B.10; section 4.15.5 (p.340) for category 2.C.1; section 4.17.5 (p.346) for category 2.C.3; and section 4.22.5 (p.361) for category 2.F. Recalculations for other IPPU categories are described in chapter 4 of the NIR. Identification and justification of recalculations for the whole IPPU sector are given in the NIR (section 10.2.1.1.2, p.594).

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I.2	2.A.1 Cement production – CO <sub>2</sub> (I.22, 2017) Transparency	Ensure all links to reference documents in the NIR are functional.	Resolved. The ERT noted that the two links referred to in the recommendation in the NIR are currently functional (section 4.2.2, p.299), as well as all other links referenced in the NIR.
I.3	2.A.4 Other process uses of carbonates – CO <sub>2</sub> (I.23, 2017) Convention reporting adherence	Use the aggregation level of analysis suggested for approach 1 in volume 1, table 4.1, of the 2006 IPCC Guidelines and identify those subcategories as significant that together contribute more than 60 per cent of emissions of this key category.	Resolved. The Party has reported category 2.A.4 as a key category in its NIR (p.307). In addition, the Party explained how it determined which subcategories were significant, on the basis of an analysis of their proportion of emissions in the category, as described in its NIR (section 4.5.1, p.307) and in line with the aggregation level of analysis suggested for approach 1 in volume 1, table 4.1, of the 2006 IPCC Guidelines.
I.4	2.B.8 Petrochemical and carbon black production – CO <sub>2</sub> (I.24, 2017) Accuracy	Estimate CO <sub>2</sub> emissions from ethylene production using a tier 3 method, applying a plant-specific CO <sub>2</sub> EF or a tier 2 carbon balance.	Resolved. The Party has reported the emissions from ethylene production in its NIR, estimated using a combination of tier 2 and tier 3 methodologies developed in collaboration with the main national plant operator (p.323). The ERT noted that plant-specific data declared and verified in the EU ETS were used to estimate the emissions in a tier 3 methodology for 2016 and 2017. A tier 2 carbon balance method was used for other years, using the 2016 and 2017 data for validation to ensure consistency.
I.5	2.B.9 Fluorochemical production – HFCs (I.15, 2017) (I.6, 2016) (I.6, 2015) (45, 2014) Transparency	Consider whether it would be possible to publish the AD and HFC-23 EFs per plant, given that production at all plants has ceased.	Resolved. The Party reported in the NIR (p.325) that the operator of the plants producing HCFC-22 refused a request to publish the relevant production data. During the review, the Party provided the ERT with the communication from the company.
I.6	2.B.9 Fluorochemical production – HFCs (I.16, 2017) (I.18, 2016) (I.18, 2015) Transparency	Provide in the NIR the necessary explanations for time-series consistency.	Resolved. The Party has reported an analysis of time-series consistency of the HFC-23 emissions as a by-product of the manufacture of HCFC-22 in its NIR (p.327), where it is observed that the specific EFs of the plant used for 1999–2011 are consistent with the default value used for 1990–1998, presenting a very small variation: 1.7 per cent average value for the EF of the plant, compared with 2.0 per cent for the default value. For 1999–2011, the reported emissions are based on daily measurements made by the plant itself. The specific EF is obtained from these data and its value exceeds the 2.0 per cent default value in two years only (2002 and 2007).
I.7	2.C.1 Iron and steel production – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (I.17, 2017) (I.4, 2016) (I.4, 2015) (43, 2014) (42, 2013) Transparency	Consider how information on the coke production carbon balance and on all carbon balances related to steel-making processes could be included in the NIR without violating confidentiality.	Resolved. The Party has reported detailed descriptions and information on the carbon content and carbon balance related to steel-making processes in section 4.15.2 of the NIR. It has also included general comparisons between the carbon content of process materials and the default carbon content included in volume 3, chapter 4, of the 2006 IPCC Guidelines (NIR table 4.15.5), as well as steel production indexed to the base year (NIR figure 4.15.2).

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I.8	2.C.1 Iron and steel production – CO <sub>2</sub> and CH <sub>4</sub> (I.25, 2017) Transparency	Report a qualitative analysis of information that is subject to confidentiality restrictions (e.g. a comparison of carbon contents applied by Spain with default EFs or trends of AD indexed to the base year) rather than including empty tables in the NIR.	Resolved. The Party has provided a general comparison between the carbon content of process materials and the default carbon content values provided for process materials in volume 3, chapter 4, of the 2006 IPCC Guidelines (NIR table 4.15.5), as well as AD indexed to the base year (NIR figure 4.15.2).
I.9	2.C.2 Ferroalloys production – CO <sub>2</sub> (I.18, 2017) (I.19, 2016) (I.19, 2015) Transparency	Include in the NIR a detailed description of and justification for the emission trends.	Addressing. The Party has included figure 4.16.2 in its NIR (p.343), which shows the relative evolution of the production of each ferroalloy that makes up this category to explain the emission trends for this category. The ERT noted, however, that the issue is still being addressed because the information provided does not completely explain the emission trends.  During the review, the Party explained that the growth of ferroalloys production has triggered the observed increase in CO <sub>2</sub> emissions for the whole category 2.C.2. However, the Party explained that the combination of an increased production of ferromanganese, which had a declining CO <sub>2</sub> EF, along the time series has resulted in a decrease in the IEF for the category 2.C.2, as shown in NIR figure 4.16.1 (p.342) and reported in CRF table 2(I).A-Hs2.  The Party noted that an explanation of the sector emissions trends will be included in its next NIR.
I.10	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.26, 2017) Convention reporting adherence	Replace the zero values with the relevant data in tables 4.2.1 and 4.2.2 of the NIR, and improve the QA/QC procedures so as to avoid such errors.	Resolved. The Party has corrected the data in tables 4.22.2 and 4.22.3 (tables 4.2.1 and 4.2.2, respectively, of the 2017 NIR) in its NIR (p.352), suggesting the use of improved QA/QC procedures.
I.11	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.27, 2017) Transparency	Provide an explanation in the NIR, with the help of a flow chart, of how Law 16/2013 justifies the use of a mass balance without the need to consider sales or stock.	Resolved. The Party has included explanations regarding Law 16/2013 and its relationship to the methodologies used to estimate F-gas emissions in the NIR (section 4.22), including the requested flow chart in NIR figure 4.22.2 (p.353).
I.12	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.28, 2017) Transparency	Use information provided under the framework of Law 16/2013 to calculate emissions from end-of-life equipment and small sealed units used for domestic air conditioning or report the emissions as “NE”, and clearly demonstrate in the NIR that emissions associated with this category can be considered insignificant in accordance with paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Addressing. The Party has stated in its NIR (section 4.22.2.1, p.355) that it has reported end-of-life emissions of HFC-32, HFC-125 and HFC-134a under category 2.F.1 stationary air conditioning as “NE”, as they are still considered insignificant. During the previous review, the Party provided AD that were used to show that emissions were below the threshold of 500 kt CO <sub>2</sub> eq, or 0.1 per cent of total national emissions, but this information was not included in the 2019 NIR or CRF table 9. During the review, the Party explained that it is working to assess options to start quantifying these emissions.
I.13	2.F.1 Refrigeration and air conditioning –	Obtain information provided under the framework of Law 16/2013	Resolved. The Party has reported in its NIR (section 4.22.1, p.354) that emissions are

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	HFCs and PFCs (I.29, 2017) Accuracy	and/or from other sources of subapplication level data that will allow the Party to use the tier 2b methodology for estimating emissions from this category.	currently reported at the subapplication level, and that the tier 2a and 2b methodologies are now applied. The relevant information is provided in CRF table 2(II)B-Hs2.
I.14	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.30, 2017) Accuracy	Include in the NIR an analysis showing why HFC-134a consumption is a suitable driver to extrapolate other refrigerants and incorporate into its analysis information on the historical availability of commercial refrigerants, in order to improve the extrapolation of F-gases from 2014 to 1998.	Resolved. The Party has reported in its NIR (p.354) that the methodology used to estimate emissions under category 2.F.1 has been modified to no longer use HFC-134a consumption to extrapolate other refrigerants. In addition, the historical availability of commercial refrigerants has been considered when estimating emissions from this category. Mobile air conditioning emissions of HFC-134a have been re-estimated on the basis of the official data regarding the vehicle fleet and car registrations for every year of the time series. Emissions from manufacturing have not changed and are based on direct data from automobile companies in Spain. End-of-life emissions have also been considered and recalculated.  For HFCs and PFCs in domestic, commercial and industrial refrigeration, refrigerated transport and stationary air conditioning, data for 2014–2016 from the national tax agency regarding Law 16/2013 have been extrapolated for 1996–2013 on the basis of variations in gross domestic product. Data regarding the commercial introduction dates of the different refrigerants have been used in the extrapolation.
I.15	2.F.1 Refrigeration and air conditioning – HFCs and PFCs (I.31, 2017) Comparability	Change the notation key from “NA” to “NO” for HFC-41, HFC-134, HFC-143 and all other F-gases that do not occur in refrigeration and air conditioning in the country.	Resolved. The Party has used the notation key “NO” in CRF table 2(II)B-Hs2 for those F-gases that do not occur in Spain.
<b>Agriculture</b>			
A.1	3. General (agriculture) (A.1, 2017) (A.1, 2016) (A.1, 2015) (51, 2014) (50, 2013) Transparency	Develop a summary table providing details of the references used in developing the country-specific methodologies and parameters used for the tier 2 approaches, and also provide a table detailing the main parameters used in the tier 2 methodologies.	Addressing. The Party has provided a summary table of references to documents used to develop the country-specific methodologies for the tier 2 approaches (tables 5.2.4 and 5.4.5). The ERT noted that Spain has developed zootechnical documents that contain some methodological data, but the country-specific parameters used in the tier 2 methodologies are not provided in them or the NIR.
A.2	3. General (agriculture) – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (A.2, 2017) (A.10, 2016) (A.10, 2015) Transparency	Update the agriculture chapter in the NIR and its annexes and include all of the methodological information required for reporting in accordance with the UNFCCC Annex I inventory reporting guidelines (para. 50), following the NIR outline described in the appendix of the guidelines.	Resolved. Spain has provided summary tables (5.2.4, 5.3.3 and 5.4.5) of its methodologies, supplemented by references to new zootechnical documents, that provide for the specific methodologies, assumptions, EFs and AD, as well as the rationale for their selection. The ERT notes that some of the documents had not yet been published on the Party’s website but were provided upon request.
A.3	3. General (agriculture)	Update table 5.1.3 in the NIR to reflect the key category analysis	Resolved. The Party has provided an updated table (table 5.1.2 in the 2019 NIR), suggesting

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	(A.19, 2017) Convention reporting adherence	from the latest annual submission and improve the QA/QC procedures to correct the identified errors in the NIR and the CRF tables.	that QA/QC procedures have been improved. The table reflects the key category analysis from the latest annual submission.
A.4	3. General (agriculture) – livestock (A.20, 2017) Accuracy	Review the numbers of animals used in the estimations for the entire time series and ensure that the populations reported in the NIR and CRF tables 3.B(a)s1 and 3.B(b) are consistent with those reported in Spain’s national survey, documenting the reasons for any derivation thereof, and explain in the NIR the method used to obtain the AD.	Resolved. The Party has reported in its NIR (section 5.2.2.1) a brief description of the process of generating animal population data for its GHG inventory and the relationship of these population data to those reported in its national survey. A reference is provided to the zootechnical document for each type of animal, where more detailed descriptions can be found, including descriptions of, and justifications for, adjustments that deviate from national survey data, such as averaging biannual survey data and adjusting upwards when zero values appear in one survey but not in an earlier or later one.
A.5	3.A Enteric fermentation – CH <sub>4</sub> (A.3, 2017) (A.2, 2016) (A.2, 2015) (53, 2014) (53, 2013) Transparency	Incorporate in the NIR detailed explanations of the AD, assumptions, parameters and EFs used for the country-specific emission estimates in order to improve transparency.	Addressing. Spain has provided in its NIR (table 5.2.2, p.382) more detailed methodological data for category 3.A; however, the EFs and parameters used were not included.
A.6	3.A.2 Sheep – CH <sub>4</sub> 3.B.2 Sheep – CH <sub>4</sub> and N <sub>2</sub> O (A.21, 2017) Accuracy	Implement a tier 2 method and country-specific EFs to estimate the CH <sub>4</sub> emissions from enteric fermentation and CH <sub>4</sub> and N <sub>2</sub> O emissions from manure management from sheep, using the new information from the national studies on sheep characteristics.	Resolved. The Party has reported in NIR tables 5.2.4, 5.3.3 and 5.4.5 that a tier 2 methodology was used to calculate CH <sub>4</sub> emissions from enteric fermentation and CH <sub>4</sub> and N <sub>2</sub> O emissions from manure management from sheep and referenced the zootechnical document that contains detailed information about the methodology.
A.7	3.B Manure management (A.4, 2017) (A.3, 2016) (A.3, 2015) (55, 2014) (56, 2013) Transparency	Provide explanatory information relating to animal waste management systems in the NIR and in the documentation box to CRF table 3.B(b).	Resolved. The Party has reported in its NIR (p.388) the methodologies used related to animal waste management systems for each type of animal, including references to zootechnical documents containing detailed information.
A.8	3.B.3 Swine – CH <sub>4</sub> (A.23, 2017) Transparency	Review the information on the population of white swine and Iberian swine allocated to different climates and fill CRF tables 3.B(a)s1 and 3.B(a)s2 with the correct information.	Resolved. The ERT noted that the Party has correctly allocated white and Iberian swine by climate zone separately in CRF tables 3.B(a)s1 and 3.B(a)s2.
A.9	3.B.4 Other livestock – CH <sub>4</sub> (A.22, 2017) Transparency	Indicate in the NIR that the emissions in the category other come only from turkeys and fill CRF tables 3.B(a)s1 and 3.B(a)s2 with all of the required information, including the MMS, for these animals.	Resolved. Spain has reported in its NIR (p.380) that emissions from the category other under other livestock include those from turkeys, ducks and other poultry. The Party has provided a note in CRF table 3.B(a)s1 indicating that the category consists mostly of turkeys. The ERT notes that the methodology for this category has changed from tier 2 in the 2017 submission to tier 1 in the 2019 submission and thus the information in CRF table 3.B(a)s2 is no longer necessary and notation key “NA” is reported by the Party.
A.10	3.D.a Direct N <sub>2</sub> O emissions from	Validate and verify the results of the study (Cayuela et al., 2017)	Resolved. Spain continues to use a tier 1 method and default EFs from the 2006 IPCC



ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
	managed soils – N <sub>2</sub> O (A.24, 2017) Accuracy	and evaluate and justify in which cases the EF would be applicable for Spain, before using it in the national inventory estimates.	Guidelines. During the review, the Party explained that a four-year field study, which would include the assessment of country-specific N <sub>2</sub> O EFs for different crops, soils, managing conditions and climates in Spain, was planned to start in mid-2019 but was delayed and efforts are being made to start the project as soon as possible. Because this new study will produce country-specific EFs, this recommendation is no longer relevant.
A.11	3.F Field burning of agricultural residues (A.17, 2017) Accuracy	Improve methodology to avoid potential underestimates and report the recalculations, including all considerations and explanations.	<p>Resolved. The Party has reported in its NIR (p.422) that field burning of agricultural residues was recalculated. Spain recalculated CH<sub>4</sub> and N<sub>2</sub>O emissions for 1990–2017. The Party explained that burning of agricultural residues now only applies to cotton.</p> <p>The ERT noted that the Party explained in its NIR (section 5.6.2.1, pp.407–408) that the Spanish inventory team has strengthened its collaboration and exchange of data with the unit within the Ministry of Agriculture, Fisheries and Food responsible for agricultural crop statistics and the agricultural nitrogen balance, and that direct exchange of data and coherence between reporting systems is now ensured. However, as explained in NIR section 5.6.2.1, the reporting cycle of these data has a one-year delay compared with the emissions inventory. As a result, the inventory team uses some prior year AD for the most recent emissions year, thus requiring recalculation in the following year when the actual AD become available.</p>
LULUCF			
L.1	4. General (LULUCF) (L.1, 2017) (L.1, 2016) (L.1, 2015) (67, 2014) (68, 2013) (102, 2012) Accuracy	Explore the methods provided in chapter 5 of the IPCC good practice guidance for LULUCF in order to consider pre-1990 land uses and land-use changes in the reporting of GHG emissions/removals to improve the accuracy of the LULUCF sector inventory.	<p>Addressing. The Party has reported that statistical methods were used to establish pre-1990 land uses and land-use changes based on available national statistical sources (NIR, section 6.1.3, p.438); however, the ERT noted that the different data sources used by Spain to assess pre-1990 land uses and land-use changes provide different figures in relation to the same land use (i.e. data related to land uses in the 2018 statistical yearbook are quite different from the data reported for each land-use category by Spain (e.g. forest land 18.640 kha (2010) and 20.346 kha (2017) as opposed to the 15.655 kha (2010) and 15.691 kha (2017) reported; cropland 17.221 kha (2010) and 16.862 kha (2017) as opposed to the 20.137 kha (2010) and 20.023 kha (2017) reported)). See ID# L.19 in table 5.</p>
L.2	4. General (LULUCF) (L.2, 2017) (L.7, 2016) (L.7, 2015) Accuracy	Provide in the NIR an update on the ongoing and planned analyses to address the proper reflection for the assessment of land-use areas and their management in the period 1970–1990.	<p>Resolved. The Party has reported an update on the ongoing and planned analyses in its NIR (section 6.1.3, p.438), stating that IPCC approach 3 (spatially explicit land-use conversion data) is expected to be implemented in the 2020 submission. See ID# L.20 in table 5.</p>

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
L.3	4. General (LULUCF) (L.4, 2017) Transparency	Mention the relevant references in the NIR instead of including full copies of all of the information in the NIR for details related to methods, equations and parameters used in the estimations, which can be found in external references (e.g. scientific papers, studies, IPCC guidelines) that are publicly available or can be provided to the ERT upon request.	Resolved. Summary methodological information and relevant references to the annex and other methodological sources are presented in the NIR. The Party has reported in its NIR (annex 3, section A3.2, p.846) details related to methods, parameters and data used in its estimations. During the review, the Party explained that the recommendation will be further implemented in future NIR submissions. In addition, the Spanish inventory system publishes methodological fact sheets for each category on its official website. The website provides detailed information about emission calculations, AD, EFs, equations, parameters and emission data. All additional documentation and papers supporting emissions calculations are also posted on this website.
L.4	4. General (LULUCF) – CO <sub>2</sub> (L.5, 2017) Transparency	Provide in the NIR a clearer explanation of the relationship between the trends for net carbon gains and losses in forest land and changes in the amount of HWP extracted from forests and how time-series consistency of AD is ensured when different data sources are used, for example by using information and graphs to facilitate these comparisons.	Resolved. The Party has explained the relationship between carbon stock change in forest land and changes in trends of HWP estimates in its NIR (section 6.8.2.1, p.504, and in annex 3, section A3.2, figures A3.6–A3.8 and table A3.31).
L.5	4.A Forest land (L.6, 2017) Transparency	Include the definitions for the classification of forests into levels I and II in the NIR, as part of the text or as footnotes when the text refers to them, with links to the websites of ICP Forests and the Ministry of Agriculture and Fisheries, Food and Environment for further details.	Resolved. The Party has reported the definitions and links to the relevant websites (i.e. ICP Forests and the Ministry of Agriculture, Fisheries and Food) in its NIR (sections 6.1.6 (p.448) and 11.3.1.2 (p.683), and, in annex 3, sections A3.2.10 (p.877) and A3.2.11.1 (p.881)).
L.6	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.7, 2017) Transparency	Include information in the NIR that better supports the explanation of stable harvest trends in the country which is used to justify the assumption that the deadwood and litter pools are in equilibrium.	Resolved. The Party has reported justification of the assumption that deadwood and litter pools are not sources in its NIR (annex 3, section A3.2.11.3 (p.883)). The ERT noted that Spain included in the NIR information related to the NFI data (annex 3, figures A3.6–A3.7) showing net increases in the forest biomass, with the time series of harvested volumes showing a decreasing trend in harvest intensity in relation to growth, for 1990–2016.
L.7	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.7, 2017) Transparency	More transparently explain in the NIR the explanation of net carbon gains in soils which is used to justify the assumption that the soils pool is in equilibrium, for example by using relevant stratification of the supporting statistics similar to the examples discussed during the review (i.e. analysis by region or by leading tree species).	Resolved. The justification of the assumption that the soil pool is not a source is provided in the NIR (annex 3, section A3.2.10, p.877). Spain provided the estimation of SOC based on data from the ICP Forests monitoring networks (levels I and II), stratified according to the Spanish forest map, showing SOC and soil carbon stock change distributions by forest species.

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L.8	4.A.1 Forest land remaining forest land – CO <sub>2</sub> (L.8, 2017) Consistency	Consider the land areas converted from forest to non-herbaceous grassland to be non-human induced and non-permanent land-use change and reallocate the resulting emissions or removals to forest land remaining forest land, which will improve consistency in the reporting of these estimates between LULUCF and KP-LULUCF, because these lands are adequately reported under FM for KP-LULUCF.	Resolved. The Party has reported forest conversion to non-herbaceous grassland in forest land remaining forest land where it continues to meet the national forest definition (NIR, sections 6.4.1.2 (p.479), 6.4.2.2 (p.483) and 6.13.2 (p.515)).
L.9	4.A.2 Land converted to forest land – CO <sub>2</sub> (L.9, 2017) Convention reporting adherence	Investigate the approach used to generate the uncertainty analysis for this category and whether assigning the high uncertainty associated with one pool (SOC) to the total uncertainty estimate for the category as a conservative approach is consistent with the 2006 IPCC Guidelines.	Resolved. The Party has reported an updated uncertainty analysis for land converted to forest land in its NIR (section 6.1.5, p.445). The ERT noted that the uncertainty assessment has been carried out on the basis of the 2006 IPCC Guidelines (vol. 4, table 12.6).
L.10	4.B.1 Cropland remaining cropland – CO <sub>2</sub> (L.10, 2017) Transparency	Include in chapter 6 of the NIR explanations for the trends in estimates for cropland remaining cropland (e.g. an increase in carbon gains between 2012 and 2014 and a large increase in soil carbon between 1990 and 2015) and of how time-series consistency is ensured, given that two data sources are used for the reporting period.	Resolved. The Party has reported a trend analysis for cropland remaining cropland in its NIR (section 6.3, p.466). The ERT noted a considerable deviation of the reported carbon stock change in living biomass in the 2019 submission compared with the 2017 and 2018 submissions that was mainly due to the use of ESYRCE AD instead of the previously used statistical yearbook data. During the review, the Party explained that two sources of information were used in previous inventory submissions: ESYRCE for 2004–2015, and the statistical yearbook for 1990–2003 (where the transitions have been estimated by the differences in surface area for each crop type in consecutive years). Spain decided to use ESYRCE as the single source of information to ensure time-series consistency.
L.11	4.C.1 Grassland remaining grassland – CO <sub>2</sub> (L.11, 2017) Completeness	Implement and/or report on progress in the implementation of the reporting of carbon stock change in the soil pool in grassland remaining grassland.	Addressing. Spain has reported “NE” for mineral soils and “NO” for organic soils in CRF table 4.C. The Party has also reported basic information related to planned improvements in its NIR (section 6.4.5, p.485). During the review, the Party explained that the improvement plan provides information on the ongoing project to improve available land-use cartography for the whole time series; in this context, one goal is the identification of changes within the grassland remaining grassland category, which would allow the estimation of carbon stock change in the category grassland remaining grassland. Additional activities are being conducted to improve the estimation of carbon stock change in grassland remaining grassland (see ID# L.12 below).

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
L.12	4.C.1 Grassland remaining grassland – CO <sub>2</sub> (L.3, 2017) (L.8, 2016) (L.8, 2015) Accuracy	Develop an approach to collect sufficient information on this category so as to be able to determine if it is a key category and therefore whether applying tier 1 methodologies to the dead organic matter and living biomass pools is appropriate.	Not resolved. The Party has reported the status of the issue as “addressing” in its NIR (table 10A2.1, p.637), stating that an update on the progress of the planned improvements will be included in the next NIR. During the review, the Party referred to the ongoing plan to improve the estimation of carbon stock change in grassland remaining grassland, which has the following aims: (1) the development of a national methodology for the estimation of carbon stock change for living biomass of wooded grassland remaining wooded grassland, using the NFI plots with canopy cover of less than 20 per cent; (2) the analysis of improved LULUCF cartography, aiming at identifying, if possible, land-use changes within the category grassland remaining grassland, which would allow the estimation of carbon stock change in grassland; and (3) the investigation of the management practices applied in Spanish grasslands across the time series. Spain stated that it intends to implement the results of the improvement actions in a forthcoming inventory submission, and by 2022 at the latest.
L.13	4(III) Direct N <sub>2</sub> O emissions from N mineralization/immobilization – N <sub>2</sub> O (L.12, 2017) Transparency	Clearly indicate in the NIR (e.g. in table 6.11.1) which land transitions lead to a loss of soil carbon and, therefore, which direct N <sub>2</sub> O emissions from nitrogen mineralization/immobilization are reported in CRF table 4(III).	Resolved. The Party has reported land conversion leading to soil carbon loss and the consequent direct N <sub>2</sub> O emissions from nitrogen mineralization/immobilization in NIR table 6.11.1 (p.509) and CRF table 4(III). During the review, the Party explained that an error occurred in the caption of NIR table 6.11.1 (t N <sub>2</sub> O instead of kt CO <sub>2</sub> eq); it stated that the error will be amended in the next annual submission.
L.14	4(V) Biomass burning – CO <sub>2</sub> (L.13, 2017) Completeness	Estimate and report the CO <sub>2</sub> emissions from biomass burning on cropland remaining cropland and grassland remaining grassland if suitable data become available, or either use the notation key “NA” if the emissions released can be assumed to be absorbed in the next growing season in accordance with the 2006 IPCC Guidelines, or use the notation key “IE” to indicate that it is included elsewhere if Spain can demonstrate that these emissions are already covered in CRF tables 4.B and 4.C.	Not resolved. The Party has used the notation key “NA” to report CO <sub>2</sub> emissions from biomass burning on cropland remaining cropland and grassland remaining grassland in CRF table 4(V). However, the ERT noted that there is no justification provided in the NIR as to whether the emissions released can be assumed to be absorbed in the next growing season for woody crops (under the category cropland) and other wooded lands (under the category grassland) affected by annual fires. During the review, the Party explained that the notation key “NA” for CO <sub>2</sub> emissions from biomass burning on cropland remaining cropland and grassland remaining grassland has been used in response to the recommendation of the previous ERT and in accordance with the 2006 IPCC Guidelines (sections 5.2.4 and 6.2.4). CO <sub>2</sub> emissions from biomass burning on grassland remaining grassland are not reported because they are largely balanced by the CO <sub>2</sub> that is reincorporated into biomass via photosynthetic activity within a matter of weeks to a few years after burning. The ERT noted that Spain reported in the NIR (annex 3, section A3.2.3, p.856) the values it used for fires affecting the woody crops and shrubland,

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
L.15	4(V) Biomass burning – CH <sub>4</sub> and N <sub>2</sub> O (L.14, 2017) Completeness	Implement the improved AD for wildfires occurring on cropland remaining cropland obtained from the State Agency of Agricultural Insurance for the calculation of CH <sub>4</sub> and N <sub>2</sub> O emissions from these lands and report the estimated CH <sub>4</sub> and N <sub>2</sub> O emissions in the annual submission, while carefully considering the potential for overestimation of emissions if the emissions from insured cropland are extrapolated to the total cropland area in the country.	<p>stating that the value of the category “all other temperate zone forests” is used for woody crops and the value of the subcategory “shrubs” is used for woody vegetation (shrubland). In addition, in table A3.8 of annex 3, Spain reported that the CO<sub>2</sub> EF for “extra tropical forest” is used for woody vegetation and woody crops and for the estimates of CO<sub>2</sub> emissions from fires occurring on lands in the conversion categories (e.g. land converted to cropland) but not for the remaining categories (e.g. cropland remaining cropland). If no justification is provided for the assumption that the emissions released by the wooded area affected by fires are absorbed in the next growing season, in accordance with the 2006 IPCC Guidelines (vol. 2, p.2.41), the CO<sub>2</sub> emissions from fires occurring in woody crops should be included under the cropland remaining cropland category and those occurring in wooded land under the grassland remaining grassland category.</p> <p>Resolved. The Party has reported GHG emissions due to wildfires on insured cropland areas in CRF table 4(V) based on data from the State Agency of Agricultural Insurance (NIR, table 6.13.1, p.516). The estimation methodology is described in the NIR (section 6.13.2 and annex 3, section A3.2.3).</p>
L.16	4(V) Biomass burning – CO <sub>2</sub> (L.15, 2017) Completeness	Report CO <sub>2</sub> emissions from controlled biomass burning on land converted to cropland or justify the use of the notation key “NE” if emissions can be considered insignificant as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines and document that in the NIR accordingly.	<p>Resolved. The Party has reported CO<sub>2</sub> emissions from controlled biomass burning on land converted to cropland as “NA” in CRF table 4(V). In the NIR (p.515), the Party explained that controlled burning on cropland (cropland remaining cropland and land converted to cropland) is only used to reduce the amount of combustible material (burning of crop and harvest residues), not for land-use change. During the review, the Party explained that it is assumed that CO<sub>2</sub> emissions from biomass burning do not have to be reported, since the carbon released during the combustion process is assumed to be reabsorbed by the vegetation during the next growing season. The ERT noted that at the 16<sup>th</sup> meeting of lead reviewers, held in 2019, it was resolved that “NA” is the correct notation key for a tier 1 assumption of biomass in equilibrium.</p>
L.17	4.G HWP – CO <sub>2</sub> (L.16, 2017) Transparency	Include in the NIR graphs and/or tables that show that the harvest rate of biomass used as fuel in Spain can be assumed to be sustainable and, therefore, resulting CO <sub>2</sub> emissions do not	<p>Resolved. The Party has reported in its NIR (section 6.8.2.1, p.504) that about 39 per cent of the growth of forest stands is harvested. In addition, 75 per cent of the harvest is made in 13.5 per cent of the wooded area. In the NIR (annex 3, section A3.2.11) the Party presented</p>

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
		need to be reported under the LULUCF sector.	the harvest time series for 1990–2016 in table A3.31 and the harvested volume, reported as percentage of growth, for 1990–2010 in figure A3.9, showing that 60 per cent of the growth was harvested in 1990 and 40 per cent of the growth was harvested in 2000, 2005 and 2010. The harvested biomass in Spain can therefore be considered to be sustainable.
Waste			
W.1	5.A Solid waste disposal on land – CH <sub>4</sub> (W.1, 2017) (W.1, 2016) (W.1, 2015) (84, 2014) (91, 2013) Accuracy	Improve the accuracy of the emission estimates by using more country-specific parameters for DOC, MCF and the methane generation rate constant.	Not resolved. The Party has provided an explanation in its NIR (section 7.2.6, p.540) regarding the expectations for obtaining country-specific information for DOC, MCF and methane generation rate parameters. The ERT noted that the Party continues to estimate the emissions by applying the default values of the 2006 IPCC Guidelines. During the review, the Party reaffirmed that it is expected that the implementation of the State Plan for Waste Management Framework 2016–2022 as well as the application of the provisions of Law 22/2011 on waste and contaminated soils, in particular the implementation of the Production and Management Registry, will contribute significantly to improving the information on the production and management of all waste streams, and therefore the emission estimations. In addition, the unit in charge of waste policy at the Ministry for Ecological Transition and the Demographic Challenge aims to update the pilot plan for the characterization of waste in the short to medium term, which should allow country-specific information for DOC, MCF and methane generation rate parameters to be obtained.
W.2	5.A Solid waste disposal on land – CH <sub>4</sub> (W.2, 2017) (W.3, 2016) (W.3, 2015) (87, 2014) (96, 2013) Accuracy	Continue the efforts to reduce the uncertainties of the AD and EFs.	Not resolved. The ERT noted that the Party continues to use the default values from the 2006 IPCC Guidelines for the uncertainties of the AD and EFs. The Party has provided an explanation in its NIR (section 7.2.6, p.540) on its efforts to improve the quality of AD and EFs. During the review, the Party explained that the Spanish inventory team is assessing options for the implementation of this recommendation (see ID# W.1 above).
W.3	5.A Solid waste disposal on land – CH <sub>4</sub> (W.3, 2017) (W.6, 2016) (W.6, 2015) Transparency	Include in the submission the information on the assumptions and underlying sources for the estimation of the waste generation per capita rate, the fraction of waste deposited and the waste amount deposited per waste type on managed sites provided during the review.	Resolved. The Party has provided relevant information in its NIR (section 7, p.531). Information on the assumptions and underlying sources for the estimation of category 5.A has been included in annex 3, section A3.3, of the NIR (pp.894–898). During the review, the Party informed the ERT that methodological descriptions, AD sources, EFs and calculation parameters have been posted on the Spanish inventory website.
W.4	5.A Solid waste disposal on land – CH <sub>4</sub>	Continue efforts to develop country-specific parameters.	Not resolved. (See ID# W.1 above.)

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
	(W.6, 2017) (W.8, 2016) (W.8, 2015) Accuracy		
W.5	5.B.1 Composting – CH <sub>4</sub> and N <sub>2</sub> O (W.8, 2017) (W.11, 2016) (W.11, 2015) Consistency	Investigate options to establish time-series consistency and recalculate historical emissions from composting accordingly, and check the values of the AD in 2013 and 2014.	Addressing. The Party has stated in its NIR (section 7.3.6, pp.545–546) that it plans to continue working, in collaboration with the various institutions, on obtaining the best information on all biomethanization plants. At the same time, in collaboration with the national focal point, Spain will try to carry out the recommendation of the previous ERT to establish the temporal coherence of the time series. The Party used the same AD as in the previous submission (until 2012, the whole volumes treated, namely all entries into the composting facilities, are taken into account, whereas from 2013 onwards, material rejected in a pre-treatment process is subtracted from the entries). During the review, the Party confirmed that no substantial progress in the implementation of the improvement plan has yet been made.
W.6	5.C Incineration and open burning of waste – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O (W.12, 2017) Transparency	Clearly refer in the waste chapter of the NIR to the quantity of CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O emissions from waste incineration with recovery for energy purposes that are included in the energy sector.	Resolved. The Party has reported the CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O emissions from waste incineration (municipal and industrial) with recovery for energy purposes that are included in the energy sector in its NIR (section 7.6.1.1, in particular tables 7.6.3–7.6.6, pp.561–562).
KP-LULUCF activities			
KL.1	Article 3.3 activities – CO <sub>2</sub> (KL.4, 2017) (KL.6, 2016) (KL.5, 2015) Transparency	Update section 11.5.2.5 of the NIR with the information provided in the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol, and include a link to the report on the technical assessment, which was provided as an annex to the initial report to facilitate the calculation of the assigned amount.	Resolved. The Party has reported the information related to the FMRL resulting from the technical assessment, which is included in the annex to decision 2/CMP.7, together with a link to the report in its NIR (section 11.5.2.4, p.701). Spain has also reported in the NIR (section 11.5.2.5, p.702) the need for a technical correction.
KL.2	FM – CO <sub>2</sub> (KL.6, 2017) (KL.8, 2016) (KL.8, 2015) Accuracy	Correct the value of the FM cap in the CRF tables in the submission by calculating the cap in relation to the base year as described in decision 2/CMP.8, annex I, paragraph 1(b).	Resolved. The Party has reported an FM cap of 79,341.275 kt CO <sub>2</sub> eq in the CRF accounting table, the same value as in the report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Spain. The ERT noted that the value included in the CRF accounting table has been calculated on the basis of the annex A source emissions in the base year as described in decision 2/CMP.8, annex I, paragraph 1(b).
KL.3	FM – CO <sub>2</sub> (KL.7, 2017) (KL.9, 2016) (KL.9, 2015) Transparency	Provide additional information in the submission to clearly demonstrate that SOC is not a source in FM.	Resolved. The Party has reported in its NIR (annex 3, section A3.2.10, p.877) information to demonstrate that the SOC pool is not a source in FM.

ID#	Issue and/or problem classification <sup>a, b</sup>	Recommendation made in previous review report	ERT assessment and rationale
KL.4	CM – CO <sub>2</sub> (KL.8, 2017 (KL.10, 2016) (KL.10, 2015) Transparency	Include in the NIR information on the trends of carbon stock changes in mineral soils in CM.	Addressing. The Party has reported information on the methodology used for soil carbon stock changes in CM in its NIR (section 6.3.2.1.3 (p.473), section 11.5.3 (p.705) and annex 3, section A3.2.6 (p.864)). The ERT noted that a description of the trend of carbon stock changes in mineral soils in CM is not included in the NIR.
KL.5	CM – CO <sub>2</sub> (KL.12, 2017) Transparency	Estimate and report emissions from organic soils in cropland or report them as “NE” while clearly showing in the NIR that emissions associated with this source can be considered insignificant as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines.	Resolved. The Party has reported emissions from organic soils in cropland as “NO” in CRF table 4(KP-I)B.2. Nevertheless, Spain has reported in its NIR (section 6.4.2.1.3, p.483) information on organic soils (6,247 ha, according to the assessment of the National Geographic Institute of Spain); emissions from these organic soils have been estimated and considered insignificant. The ERT noted that, according to FAOSTAT, the area of cultivated organic soils under cropland in Spain was 11,285 ha in 2017. During the review, the Party explained that, according to National Geographic Institute data, organic soils in Spain cover 6,247 ha, representing 0.01 per cent of the national land surface. The Party further explained that the natural vegetation of these histosols is heathland and they are not cultivated in Spain.
KL.6	HWP – CO <sub>2</sub> (KL.9, 2017) (KL.12, 2016) (KL.12, 2015) Transparency	Report in the NIR on progress in improving the estimation and reporting of net emissions from HWP.	Resolved. The Party has reported an updated description related to the HWP emission estimates in its NIR (sections 6.8.2 (p.503), 11.3.1.1 (p.682), 11.4.5 (p.695) and 11.5.2.7 (p.705)). The ERT noted that the updated information reported in the NIR clarifies the estimation process and the improvements made in the HWP estimates.
KL.7	Biomass burning – CO <sub>2</sub> (KL.13, 2017) Completeness	Report CO <sub>2</sub> emissions from controlled biomass burning under deforestation in CRF table 4(KP-II)4 or justify the use of the notation key “NE” if emissions can be considered insignificant as defined in paragraph 37(b) of the UNFCCC Annex I inventory reporting guidelines and document this in the NIR accordingly.	Resolved. The Party has reported notation keys “NA”, “NO” for CO <sub>2</sub> emissions from controlled biomass burning under deforestation in CRF table 4(KP-II)4. During the review, the Party explained that CO <sub>2</sub> emissions from controlled biomass burning have been reported under deforestation using the notation key “NA” because controlled burning in Spain is not used as a land-use change practice, as noted in NIR section 11.3.1.1 (p.682). The only controlled burning emissions assigned to lands under the Kyoto Protocol activity deforestation are those that are carried out on grassy grasslands that remain as such (from forest land converted to grassland – grassy), where the 20-year IPCC default applies; and on cropland, in order to remove crop and pruning residues. However, emissions from controlled burning on cropland are reported in the agriculture and waste sectors (CRF tables 3.F and 5.C.2); therefore, on lands under the deforestation activity, only emissions from controlled burning on grassland remaining grassland are reported, as included in NIR section 6.13.



<sup>a</sup> References in parentheses are to the paragraph(s) and the year(s) of the previous review report(s) in which the issue and/or problem was raised. Issues are identified in accordance with paras. 80–83 of the UNFCCC review guidelines and classified as per para. 81 of the same guidelines. Problems are identified and classified as problems of transparency, accuracy, consistency, completeness or comparability in accordance with para. 69 of the Article 8 review guidelines, in conjunction with decision 4/CMP.11.

<sup>b</sup> The review report of the 2018 annual submission of Spain was not available at the time of the 2019 review. Therefore, the previous recommendations reflected in table 3 are taken from the 2017 annual review report. For the same reason, 2018 is excluded from the list of review years in which the issue could have been identified.

#### IV. Issues identified in three successive reviews and not addressed by the Party

9. In accordance with paragraph 83 of the UNFCCC review guidelines, the ERT noted that the issues included in table 4 have been identified in three successive reviews, including the review of the 2019 annual submission of Spain, and have not been addressed by the Party.

Table 4

##### Issues and/or problems identified in three successive reviews and not addressed by Spain

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
General		
G.1	Continue to address the transparency issues identified in the previous and current annual review report and provide information on the implementation of the recommendations on transparency in the NIR	3 (2015/2016–2019)
Energy		
	No issues identified	
IPPU		
I.9	Include in the NIR a detailed description of and justification for the emission trends	3 (2015/2016–2019)
Agriculture		
A.1	Develop a summary table providing details of the references used in developing the country-specific methodologies and parameters used for the tier 2 approaches, and also provide a table detailing the main parameters used in the tier 2 methodologies	5 (2013–2019)
A.5	Incorporate in the NIR detailed explanations of the AD, assumptions, parameters and EFs used for the country-specific emission estimates in order to improve transparency	5 (2013–2019)
LULUCF		
L.1	Explore the methods provided in chapter 5 of the IPCC good practice guidance for LULUCF in order to consider pre-1990 land uses and land-use changes in the reporting of GHG emissions/removals to improve the accuracy of the LULUCF sector inventory	6 (2012–2019)
L.12	Develop an approach to collect sufficient information on this category so as to be able to determine if it is a key category and therefore whether applying tier 1 methodologies to the dead organic matter and living biomass pools is appropriate	3 (2015/2016–2019)
Waste		
W.1	Improve the accuracy of the emission estimates by using more country-specific parameters for DOC, MCF and the methane generation rate constant	5 (2013–2019)

<i>ID#</i>	<i>Previous recommendation for the issue identified</i>	<i>Number of successive reviews issue not addressed<sup>a</sup></i>
W.2	Continue the efforts to reduce the uncertainties of the AD and EFs	5 (2013–2019)
W.4	Continue efforts to develop country-specific parameters	3 (2015/2016–2019)
W.5	Investigate options to establish time-series consistency and recalculate historical emissions from composting accordingly, and check the values of the AD in 2013 and 2014	3 (2015/2016–2019)
KP-LULUCF activities		
KL.4	Include in the NIR information on the trends of carbon stock changes in mineral soils in CM	3 (2015/2016–2019)

<sup>a</sup> The report on the review of the 2018 annual submission of Spain has not yet been published. Therefore, 2018 was not included when counting the number of successive years in table 4. As the reviews of the Party's 2015 and 2016 annual submissions were conducted together, they are not considered successive and 2015/2016 is considered as one year.

## V. Additional findings made during the individual review of the 2019 annual submission

10. Table 5 contains findings made by the ERT during the individual review of the 2019 annual submission of Spain that are additional to those identified in table 3.

Table 5

**Additional findings made during the individual review of the 2019 annual submission of Spain**

<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?<sup>a</sup></i>
<b>General</b>			
G.5	Key category analysis	<p>The ERT noted that in the key category analysis, carried out using IPCC approach 2, level assessment, a single category (5.D N<sub>2</sub>O) accounted for almost 40 per cent of total uncertainty, owing to an uncertainty value equal to 4,900 per cent attributed to the EF of the same category. This could affect the analysis, excluding other potential key categories. During the review, the Party explained that the uncertainty value has been calculated on the basis of the range reported for the EF in the 2006 IPCC Guidelines (vol. 5, table 6.11). Moreover, the Party explained that in the <i>2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> the range of the EF has been reduced, resulting in a calculated uncertainty equal to 1,400 per cent, and that this new value will be applied for future submissions.</p> <p>The ERT notes that this planned change will improve the key category analysis, but also notes that the uncertainty value for this category will continue to affect the analysis, resulting in a selected uncertainty value that is seven times higher than the next highest one, and encourages the Party to consider revising the uncertainty for category 5.D N<sub>2</sub>O, for example by selecting a more appropriate range of values for the EF, in line with national circumstances and the literature providing the basis for the EF in the 2006 IPCC Guidelines.</p>	Not an issue/problem
G.6	Uncertainty analysis	<p>The Party has not reported a detailed uncertainty analysis for the base year in its NIR. Moreover, it stated that the trend uncertainty at the category level is reported in the relevant sectors but the uncertainty for the trend for the total GHG emission inventory has not been provided. The ERT noted that this is not in accordance with paragraphs 15 and 42 of the UNFCCC Annex I inventory reporting guidelines. During the review, the Party provided the documentation required and stated that this information will be included in the next submission.</p> <p>The ERT recommends that the Party report an uncertainty analysis in accordance with paragraphs 15 and 42 of the UNFCCC Annex I inventory reporting guidelines, including uncertainties for at least the base year and the latest inventory year and the trend uncertainty between these two years.</p>	Yes. Convention reporting adherence
<b>Energy</b>			
E.13	1. General (energy sector) – liquid fuels – CO <sub>2</sub>	<p>The Party has reported in its NIR (figure 3.3.4, p.175) a significant increase in the use of refinery gas for energy in the petroleum refining category 1.A.1.b, starting in about 2010. Figure 3.16.1 (p.272) also shows an increase in refinery fugitive emissions starting around the same time. Furthermore, the text discussing fugitive emissions from refining/storage under category 1.B.2.a.4 (p.271) indicates that refinery throughput increased by 29 per cent from 1990 to 2017 but emissions increased by 142 per cent over the same time frame. The ERT noted that more information on changes in the refinery sector would help to verify that there is no double counting of emissions (e.g. more refinery gas used for energy coming from venting or flaring would potentially result in lower fugitive emissions). During the review, the Party provided more information on the refinery sector in Spain and how it has significantly changed in the last decade. While the amount of total crude oil processed has slightly increased, there have been notable developments in cracking processes and production efficiency, particularly from around 2010, when the two largest refineries in Spain were revamped. These changes entailed the installation of new units (fluid catalytic crackers, hydrogen units, etc.), which brought greater efficiency in crude oil processing but also more fuel</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
E.14	Feedstocks, reductants and other non-energy use of fuels – gaseous fuels – CO <sub>2</sub>	<p>consumption and changes in the energy mix. Greater efficiency in crude oil processing also brought increased production of oil refined products and, collaterally, higher refinery fugitive emissions as observed in the NIR (figure 3.16.1). Additionally, increased energy efficiency and new units involved the use of refinery fuels, such as refinery fuel gas, which are off-gases from distillation or conversion units used as a fuel. Finally, the Party indicated that there is no risk of double counting of emissions since fuel amounts used in the different refinery units are handled independently and refinery managers ensure an energy balance in the data provided.</p> <p>The ERT recommends that the Party provide more detail in the NIR for category 1.B.2 petroleum refining, describing changes in the sector and how they effect changes in emissions over time for this category. Furthermore, the Party should provide data for category 1.A.1.b explaining that the refinery gas increase for this category comes from changes in the refining sector and that there is no double counting of emissions between refinery gas reported in category 1.A.1.b and fugitive emissions from refineries reported in category 1.B.2.</p> <p>The Party has shown in annex 2 to its NIR that the energy balance information used to calculate fuel combustion emissions excludes non-energy use of fuels. For example, table A2.8 (p.839) shows 58,922 TJ natural gas as the non-energy consumption in the chemical industry in 2017. The ERT noted that, assuming a default CO<sub>2</sub> EF for natural gas of 15.22 t C/TJ, this represents approximately 3,000 kt potential CO<sub>2</sub> emissions. It is also not clear where the quantity of natural gas used for hydrogen production is reflected in the reference approach.</p> <p>CRF table 1.A(d) reports 25,963 TJ natural gas in 2017 for non-energy use in the ammonia production industry. However, that does not account for all the natural gas non-energy use. During the review, the Party explained that the inventory uses the comparison between the reference and sectoral approaches as a tool to detect inconsistencies between the country's energy supply and the actual use of fuels in each inventory sector. As explained in annex 4 to the NIR (p.903), gaps observed between the two approaches in natural gas consumption can be explained by consumption data reported under category 1.B, including in the production of hydrogen in refineries (1.B.2.a.4). Table A4.4 of the NIR (p.912) reports 32,958 TJ natural gas consumption in 2017 under category 1.B.2.a.4. Following the example given, 25,963 TJ natural gas reported in CRF table 1.A(d) as used in the ammonia production industry added to the quantity shown in table A4.4 of the NIR under category 1.B.2.a.4 for hydrogen production (32,958 TJ) leads to the total non-energy use figure of 58,922 TJ.</p> <p>The ERT recommends that the Party include information on the disposition of non-energy uses of fuels in the energy balance discussion in annex 2 to the NIR to clarify that the non-energy use of fuels is accounted for and there is no underestimation of emissions from fuel combustion. This information could include the specific 2017 example for natural gas where the non-energy use value of 58,922 TJ as reported in table A2.8 is balanced by the 25,963 TJ natural gas reported in CRF table 1.A(d) in 2017 used in ammonia production and the 32,958 TJ reported in table A4.4 of the NIR under category 1.B.2.a.4 used in hydrogen production. The ERT also recommends that the Party include the use of natural gas for hydrogen production in CRF table 1.A(d), as appropriate, and ensure consistency between the information in CRF tables 1.A(b) and 1.A(d) and the information in the NIR.</p>	Yes. Transparency
E.15	1.A.1.b Petroleum refining – all fuels – CO <sub>2</sub>	<p>The Party has reported in its NIR (p.178) that there are plans to update the information related to EFs for category 1.A.1.b and to publish that information in 2019 when it becomes available. The ERT noted that it is not clear whether this work has been completed and whether updated EFs were included in this version of the inventory. During the review, the Party explained that the information update in the NIR was published in April 2019 as an</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
		<p>update to the methodological fact sheet for category 1.A.1.b and the information is available on the Spanish inventory system website. It also explained that the data provided in NIR tables 3.3.3–3.3.5 and used in this version of the inventory reflect these updates and are consistent with the information posted on the Spanish inventory system website.</p> <p>The ERT recommends that the Party revise the NIR to clarify that the EFs being used for category 1.A.1.b reflect the latest information from planned updates and remove the reference to the planned publication of data in 2019.</p>	
E.16	1.A.2 Manufacturing industries and construction – all fuels – CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party has reported in the NIR (p.208) that CH<sub>4</sub> and most N<sub>2</sub>O EFs for category 1.A.2 are based on the 2006 IPCC Guidelines but also that a tier 2 approach is used for CH<sub>4</sub> and N<sub>2</sub>O emissions for industrial machinery. The ERT noted that from this description it is not clear which sources in this category use a tier 1 approach and which use a tier 2 approach.</p> <p>During the review, the Party explained that category 1.A.2 includes a wide range of combustion processes but that EFs used for CH<sub>4</sub> and N<sub>2</sub>O emissions are tier 1 (2006 IPCC Guidelines) except for the following:</p> <p>(a) Cement and lime (included in category 1.A.2.f non-metallic minerals): the EF for CH<sub>4</sub> is tier 3 (2006 IPCC Guidelines);</p> <p>(b) Off-road vehicles and other machinery (1.A.2.g.vii): EFs are tier 2 (2016 EMEP/EEA guidebook).</p> <p>The ERT recommends that the Party include in the NIR the information on the approaches used to calculate CH<sub>4</sub> and N<sub>2</sub>O emissions that it provided during the review.</p>	Yes. Transparency
E.17	1.A.3.a Domestic aviation – liquid fuels – CO <sub>2</sub>	<p>The Party has reported in the NIR (p.216) that for category 1.A.3.a the data on consumption of aviation gasoline obtained from EUROCONTROL were aligned with totals from national energy statistics. However, it is not clear whether the same alignment was carried out for kerosene jet fuel. The ERT noted that the NIR (p.219) indicates that data for kerosene jet fuel for 1990–2004 have been modified to better align with energy statistics but it is not clear how that was done or how data align in recent years, which could lead to over- or underestimation of kerosene jet fuel use and inconsistency of the time series. During the review, the Party explained that consumption data are obtained from EUROCONTROL for 2005–2017 and are very similar to the total kerosene consumption values given in the national statistics for the aviation sector, so no adjustment is needed. For the fuel consumption series for 1990–2004, an adjustment based on the average of the difference between data from the national statistics and from EUROCONTROL for the available years is established for each airport per year, zone and phase (domestic and international/landing and take-off, and cruising) in IPCC accounting and applied to the national statistics data for 1990–2004 to develop estimates of kerosene fuel use for those years.</p> <p>The ERT recommends that the Party report in section 3.7.2.1 of its NIR the information it provided during the review on the similarity between data on kerosene consumption obtained from EUROCONTROL for 2005–2017 and those provided in the national statistics for the aviation sector for those years; and on the adjustment based on the average of the difference between those data that is established for each airport per year, zone and phase in IPCC accounting and applied to the national statistics data for 1990–2004 to develop estimates of kerosene fuel use for those years.</p>	Yes. Transparency

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E.18	1.A.3.b Road transportation – liquid fuels – N <sub>2</sub> O	<p>The Party has reported IEFs for N<sub>2</sub>O emissions from category 1.A.3.b (road transportation) in its NIR (table 3.8.11, p.237). There are a number of abrupt changes in the IEFs, for example in 2000 and 2001 for gasoline, along with more gradual changes over time. The NIR (section 3.8.2.2.4) discusses how the changes in the factors are due to changes in fuel sulfur content and in vehicle control technologies. However, the ERT noted that it was not clear in the NIR what was causing the abrupt changes, since vehicle technologies are typically phased in gradually over time as the vehicle fleet changes.</p> <p>During the review, the Party explained that the abrupt changes are mainly linked to changes in fuel sulfur content, as reported in NIR table 3.8.11. For example, according to the N<sub>2</sub>O EFs outlined in the 2016 EMEP/EEA guidebook (July 2018 update), tables 3-56–3-63, for a given fleet mix of vehicle technologies (Euro 1–5, etc.), changes in sulfur content of gasoline will have a significant impact on overall N<sub>2</sub>O EFs assumed. The Party could potentially include the sulfur content of fuels (for gasoline, weighted by the amount of leaded and non-leaded fuel used) in figure 3.8.11, plotted on a second axis.</p> <p>The ERT recommends that the Party clarify the text in section 3.8.2.2.4 of the NIR to describe the impact of sulfur content on EFs for different vehicle control technologies.</p>	Yes. Transparency
E.19	1.A.3.b Road transportation – gaseous fuels – CO <sub>2</sub>	<p>The Party has reported in its NIR (table 3.8.7, p.233) a description of how EFs for road transportation fuels were determined for category 1.A.3.b on the basis of the carbon content of the fuels. CO<sub>2</sub> IEFs for natural gas are also shown (table 3.8.8, p.234) over time. Table 3.8.7 shows a single value for carbon content, which implies consistent EFs for natural gas, and table 3.8.8 shows variability in factors over time. The NIR contains an explanation for the variability of IEFs in other fuels, but not for natural gas. The ERT noted that it is not clear how the CO<sub>2</sub> factor for natural gas was determined.</p> <p>During the review, the Party explained that, as described in part in the NIR (pp.233–234), in the case of natural gas, annual gas characteristics for Spain, and its carbon content in particular, are known across the time series and the CO<sub>2</sub> EF is calculated according to the 2006 IPCC Guidelines assuming that all the carbon in the fuel is emitted in the form of CO<sub>2</sub>.</p> <p>The ERT recommends that the Party clarify the description in its NIR as to how EFs for natural gas for category 1.A.3.b were determined, making it similar to that used to report the country-specific natural gas CO<sub>2</sub> EF for other sectors (e.g. as described in section 3.11.2.2).</p>	Yes. Transparency
E.20	1.A.3.b Road transportation – diesel fuel – CO <sub>2</sub>	<p>The Party has reported in its NIR (table 3.8.7, p.233) the hydrogen/carbon and oxygen/carbon ratios for transportation fuels used to calculate CO<sub>2</sub> EFs for category 1.A.3.b. As stated in the NIR (p.232), this approach is based on the methodology presented in the 2006 EMEP/EEA guidebook (May 2017 version). Furthermore, the NIR (p.233) indicates that the inventory does not have specific characterizations of the fuels used in Spain but that the values used (72.8 t CO<sub>2</sub>/TJ for fossil diesel fuel used in road transportation category 1.A.3.b) are in the range of IPCC default values 72.6–74.8 t CO<sub>2</sub>/TJ (2006 IPCC Guidelines, vol. 2, table 3.2.1), and similar to the ranges obtained by other European countries that have conducted fuel studies, and those contained in the European study on automotive fuels (Edwards et al., 2014), namely 73.42–73.81 t CO<sub>2</sub> eq/TJ. The 72.8 t CO<sub>2</sub>/TJ for fossil diesel fuel is the base year value and represents diesel fuel before blending with biofuels; later year IEFs are different but also represent blending with biofuels. Comparisons were made to the base-year EF values as those best represent comparisons with other diesel fuel factors. The ERT noted that the CO<sub>2</sub> EF used by Spain for diesel fuel is at the</p>	Yes. Accuracy

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E.21	1.A.3.d Domestic navigation – liquid fuels – CO <sub>2</sub>	<p>lower end of the IPCC range and low compared with factors used in other European countries (e.g. France – 75.59 t CO<sub>2</sub> eq/TJ, Germany – 74.03 t CO<sub>2</sub> eq/TJ, Italy – 73.27 t CO<sub>2</sub> eq/TJ and Portugal – 74.24 t CO<sub>2</sub> eq/TJ). The ERT noted that the decision tree in the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.11) indicates that Parties should use country-specific carbon content in determining the EFs for key categories. The ERT also noted that the NIR does not contain information as to how the EF applied is appropriate for national circumstances in order to determine the accuracy of the results, particularly as CO<sub>2</sub> from diesel fuel use in road transportation is the largest key category (level 1), representing 19.5 per cent of total emissions (NIR, table 1.5.1).</p> <p>During the review, the Party explained that it has decided not to update these factors until after the intended migration to the latest version of COPERT (planned to be completed by 2020), thus integrating all available updates. Furthermore, with respect to the characterizations of fuels and the investigation into country-specific values for transportation fuels, Spain, as a member of the EU, has fully harmonized legislation on the quality of petrol and diesel fuels (EU directive 2003/17/EC). The Party also stated that fuel characterization has been performed at the European level, within the framework of a 2014 Joint Research Centre report (Edwards et al., 2014), which did not observe substantial differences among fuels sold in the different European countries and asserted that regional values can therefore be considered country-specific. The ERT noted that, as the Party makes updates to the inventory based on the latest version of the COPERT model, it should evaluate the diesel fuel CO<sub>2</sub> EFs from the existing approach (2016 EMEP/EEA guidebook (May 2017 version)), the COPERT model, the values from the 2014 Joint Research Centre report, values from any Spanish refineries that participated in the Joint Research Centre study and values used by other European countries.</p> <p>The ERT recommends that the Party use the decision tree in the 2006 IPCC Guidelines (vol. 2, chap. 3, p.3.11) for determining EFs or either evaluate the applicability of the CO<sub>2</sub> EF used for road transportation – diesel fuel and update the EF based on the results of the evaluation, or provide a justification as to how the CO<sub>2</sub> EF applied for diesel fuel is appropriate to the national circumstances, including comparisons (e.g. with the COPERT model) to the values from the 2014 Joint Research Centre report and values used by other European countries. The ERT believes that future ERTs should consider this issue further to ensure that there is no underestimation of emissions for this activity.</p> <p>The Party has reported in its NIR (figure 3.10.2 and table 3.10.3, p.246) a significant increase in residual fuel oil for national maritime transport since 2015. The NIR (p.247) indicates that this could be owing to new technologies introduced to account for lower sulfur fuel regulations. However, there is also an increase in total fuel use AD overall, and not just switching of fuel types. The ERT noted that while total fuel use in category 1.A.3.d in 2017 is still below historical totals, it is not clear from the NIR why overall fuel use might be increasing at a rapid pace. During the review, the Party explained that the drastic rise in fuel oil supply to domestic navigation activities is likely to be due to a combination of factors and that statistical corrections have been carried out in the national energy statistics for the sector since 2016. Additionally, the increasing number of vessels registered in Spanish ports (data from the Spanish Port Authority), the current market situation in the Strait of Gibraltar and, finally, new technology introduced in residual fuel oil ships to adapt the engines to the legislation regarding sulfur content in marine fuels could also be playing a role in driving the observed trend.</p>	Yes. Transparency

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		The ERT recommends that the Party explain the dramatic increase in residual fuel oil consumption in recent years by including in its next NIR the information it provided during the review on the combination of factors responsible.	
IPPU			
I.16	2.A.2 Lime production – CO <sub>2</sub>	<p>The Party has reported in its NIR (p.301) that ANCADE provides estimates of lime production for some installations; however, it was not clear which years and plants are covered by the estimates provided. During the review, the Party explained that ANCADE provided estimated production for 1990–2007 for plants that were not part of the association, in addition to providing detailed information for every installation within the association. Since 2007, information for all installations is gathered directly at the individual plant level by the inventory system via EU ETS data and individualized questionnaires.</p> <p>The ERT recommends that the Party, in order to enhance transparency, include in the NIR an explanation of the estimation of emissions from the production of lime, including the years when ANCADE provided data or estimations and the years when data were gathered directly from installations.</p>	Yes. Transparency
I.17	2.C.3 Aluminium production – CF <sub>4</sub> and C <sub>2</sub> F <sub>6</sub>	<p>The Party has reported a CO<sub>2</sub> emissions trend that is in line with aluminium production; however, there was a decrease relative to production in CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub> emissions in the time series (NIR, p.343). During the review, the Party explained that there are three electrolytic aluminium producing plants in Spain, which belong to a single company. This company has made considerable investments throughout the time series to optimize the production processes and this has resulted in a significant reduction in CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub> emissions. Among these measures, the reduction in the number and intensity of overvoltage, which is responsible for CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub> emissions, is the most important. In line with this objective, the company signed a voluntary agreement in 2008 with the Ministry of Environment, committing itself to investing in reducing emissions of these gases and contributing to the achievement of the objectives acquired by Spain after the ratification of the Kyoto Protocol.</p> <p>The ERT recommends that the Party include in the NIR information on the reasons for the decreasing trends in CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub> emissions despite the stable production of aluminium over the time series.</p>	Yes. Transparency
I.18	2.C.7 Other (metal industry) – CO <sub>2</sub>	<p>The Party has reported in its NIR (figure 4.20.2, p.348) that CO<sub>2</sub> emissions for category 2.C.7 are calculated according to a tier 3 methodology using a carbon mass balance with data provided directly by the only silicon producing factory in Spain and that the CO<sub>2</sub> IEF of silicon production has decreased by approximately 20 per cent since 2010. However, no information is provided in the NIR on this decreasing trend.</p> <p>During the review, the Party explained that estimated CO<sub>2</sub> emissions depend on several parameters, such as the carbon content, the humidity of the inputs and outputs involved in the process and the rate of biogenic reducing agents used, and small changes in these parameters cause variations in the CO<sub>2</sub> IEF. Since 2006, the IEF has decreased by 16 per cent, with an annual average reduction rate of 1.5 per cent. However, the highest inter-annual CO<sub>2</sub> IEF reduction is observed for 2010 (–9.6 per cent). For this particular year, wood replaced some or all coal in the production process and therefore emissions were lower and the IEF decreased. The observed trend of the IEF in recent years is likely to be due to changes in the energy mix and the introduction of alternative fuels other than fossil fuels and energy-efficiency improvements in the process.</p>	Yes. Transparency



<i>ID#</i>	<i>Finding classification</i>	<i>Description of the finding with recommendation or encouragement</i>	<i>Is finding an issue and/or a problem?<sup>a</sup></i>
		The ERT recommends that the Party include in its NIR an explanation of the trend of the CO <sub>2</sub> IEF of silicon production after 2010, such as the replacement of coal with wood and improvements in energy efficiency in the process.	
I.19	2.G.3 N <sub>2</sub> O from product uses – N <sub>2</sub> O	<p>The Party has reported in its NIR (p.365) that the AD used to estimate emissions from the use of N<sub>2</sub>O in the food industry as a propellant for pressure packaging apply to N<sub>2</sub>O production for food purposes in Spain. During the review, the Party explained that the AD (N<sub>2</sub>O used) used for the emission estimations for this activity apply to the total amount of gas used as a propellant by the food industry in Spain, thus including national production and imports but excluding exports.</p> <p>The ERT recommends that the Party further clarify in its NIR that the AD used in the estimation of N<sub>2</sub>O emissions from the food industry include national production and imports but exclude exports.</p>	Yes. Transparency
Agriculture			
A.12	3.B.4 Other livestock – CH <sub>4</sub>	<p>The Party reported empty cells in CRF table 3.B(a)s2 for the subcategory other under the category other livestock. The ERT noted that the reporting in this table is for Parties applying a tier 2 methodology. During the review, the Party explained that CRF table 3.B(a)s2 for category 3.B.4 (other livestock) has been completed with MMS information for goats (3.B.1.4.2), horses (3.B.1.4.3), mules and asses (3.B.1.4.4) and poultry (3.B.1.4.5). However, for other poultry (3.B.1.4.1), since emissions are calculated using a tier 1 methodology, there is no MMS information to be reported in CRF table 3.B(a)s2. The ERT noted that, according to table 5.3.3 in the NIR, the categories for both goats and other poultry use a tier 1 methodology, yet there are values reported in some fields for the category goats in CRF table 3.B(a)s2.</p> <p>The ERT encourages the Party to complete any blank cells in CRF table 3.B(a)s2 with the appropriate values or notation keys in a consistent manner to improve transparency.</p>	Not an issue/problem
A.13	3.F Field burning of agricultural residues – N <sub>2</sub> O and CH <sub>4</sub>	<p>Spain reported in CRF table 3.F values in the category other without specifying the type of crop. During the review, the Party explained, as shown in NIR table 5.7.4 (p.419), that from 2005 only burned cotton residues have been included under this category.</p> <p>The ERT recommends that the Party specify in CRF table 3.F which crops it includes in the category other.</p>	Yes. Transparency
LULUCF			
L.18	Land representation	<p>The Party has reported that verification activities have been carried out to set up a hierarchy among the different data sources for land classification in its NIR section 6.1.6 (p.448). In response to a question from the ERT requiring a summary of the quantitative results for these verification activities, during the review, the Party explained that only a qualitative comparative analysis among the different cartography data sources has been carried out. This comparative analysis, carried out for the 2014 submission to assess land use and land-use change areas between 1990 and 2012, has considered the following combinations:</p> <p>(a) CORINE land cover map 1990 with MFE50 compared with CORINE land cover map 2006;</p> <p>(b) MCA 1980–1990, MFE 1:200,000 and CORINE land cover map 1990 compared with MCA 2000–2010, MFE50 and CORINE land cover map 2006;</p>	Yes. Transparency

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(c)		<p>Maps from the second NFI compared with MFE50.</p> <p>As a result of this comparative analysis, basic map sources, such as CORINE land cover, MFE50 and MCA 1980–1990, were selected, while some data sources such as maps from the second NFI were discarded because they were not comparable. The available data sources were then classified according to their appropriateness for a land-use category using the following hierarchy: forest land, cropland, grassland, wetlands, settlements and other land.</p> <p>The ERT recommends that the Party report in its NIR the additional information provided during the review (i.e. hierarchy among land-use categories, summary table with the result of the comparative analysis of cartography data sources) and a table listing the different map sources and their related spatial resolution, including minimum mapping units.</p>	
L.19	Land representation	<p>As a follow-up to the information provided in relation to ID# L.1 in table 3, the Party explained that the Spanish inventory uses information on land-use areas based on national statistics that only provide total land-use areas and not data on conversion between land uses for 1970–1990, in the absence of cartographic information. Furthermore, the agricultural statistical yearbook was designed to provide information about the agriculture sector and not for all the LULUCF land-use categories. The best available cartographic information (CORINE land cover) provides the basic data for LULUCF from 1990 onwards. An ongoing land-use cartography project aims to compile and analyse available land-use cartography for Spain for 1970–2015 in order to implement IPCC approach 3 for the whole time series; the results of the above-mentioned project are planned to be used for the 2020 inventory submission. During the review, Spain further explained that the areas identified in the statistical yearbook are the result of a national aggregation, taking into account the ESYRCE results (as reported in the 2018 statistical yearbook, part 1, chap. 3), while the area reported under the category cropland is assessed using a cartographic procedure, completed and adjusted with statistical information, following the recommendations of the previous ERT. Statistical data may be used as reference information to cross-check cartographic outcomes. Spain also explained that, despite the high uncertainty of CORINE cartography, statistical data based on surveys and not direct observation are likely to have even higher uncertainties and do not allow identification of transitions to or from a determined land use. For example, the Spanish <i>dehesas</i> (grazing lands with oak trees), covering around 3 million ha (around 6 per cent of the national territory), are included, according to the land-use classification used by Spain, under the category forest land or grassland, depending on the canopy cover fraction, but are considered in the agriculture statistics as cropland, grassland or other land. On this basis, Spain clarified that it considered that cartographic information is more suitable for LULUCF inventory purposes, and so statistical information has been used only when no cartographic data were available (i.e. 1970–1989).</p> <p>The ERT recommends that Spain include the additional information described above regarding the sources for land classification and the justification for their use in its NIR.</p>	Yes. Transparency
L.20	Land representation	<p>As a follow-up to the information provided in relation to ID# L.2 in table 3, the Party explained that, between 2018 and 2019, the Spanish inventory team conducted a project for the improvement of LULUCF cartography, which aimed to compile and analyse the available land-use cartography for Spain for 1970–2015 in order to implement IPCC approach 3 for the whole time series. During the project, the available cartography data sources for each reference year have been classified according to the hierarchy among land-use categories. All the data on land-use surface areas obtained for each reference date are being analysed and land-use changes assessed to ensure time-series consistency. The harmonization and standardization of various cartographic data sources, developed for</p>	Yes. Accuracy

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		<p>different purposes, has been one of the major challenges in the project development. Similarly, new data provided by the cartography project are being cross-checked with data currently used in the national inventory. Preliminary results are currently being reviewed and will be available at the end of 2019; it is planned that they will be used for the 2020 inventory submission.</p> <p>The ERT welcomes the planned improvement and recommends that Spain include in the NIR a detailed explanation of the project for the improvement of LULUCF cartography (i.e. the spatial data sources used, the procedure implemented for the remote sensing and cartographical data, elaboration of methods and the hierarchy established among land-use categories) and use its results. The ERT also recommends that the Party provide information on how time-series consistency is ensured and harmonization of the various data sources is achieved.</p>	
L.21	Land representation	<p>The Party has reported areas under the forest land and grassland categories in CRF tables 4.A and 4.C. The ERT noted that the areas reported under forest land and grassland in the 2019 submission are different from the same areas reported in the 2018 and 2017 submissions. During the review, the Party explained that following ERT recommendations, in the 2018 inventory edition (1) land use and land-use change areas for 1970–1990 were taken into account for the estimations; and (2) forest land converted to non-herbaceous grassland was considered to be a non-permanent land-use change. Both changes triggered a recalculation of the areas reported for the whole time series.</p> <p>The ERT noted that the information provided clarifies the issue.</p>	Not an issue/problem
L.22	4.A.1 Forest land remaining forest land – CO <sub>2</sub>	<p>The Party has reported in its NIR (section 6.2.2.1.1, p.461) that equation 2.8 (stock difference method) of the 2006 IPCC Guidelines (vol. 4, chap. 2) has been applied to estimate carbon stock changes for forest land remaining forest land. In response to a question from the ERT during the review, the Party explained that it applies a stock difference method for estimating the carbon stock changes in living biomass for forest land remaining forest land, as stated in the NIR (section A3.2.1, p.846). Spain further explained that there are currently three complete Spanish NFIs that provide information on the biomass carbon stock for a given province, in t carbon/ha, at two or three points in time (a fourth NFI is currently under way but data from all provinces are not yet available); information is provided in NIR table A3.3 (pp.848–849). Spain also informed the ERT that the carbon stock estimations have been carried out at the provincial level in the 50 provinces in Spain and supplied an Excel file with the data for the province of Madrid for the three complete NFIs, consistent with the values reported in NIR table A3.3 (annex 3, section A3.2.1).</p> <p>The ERT recommends that the Party enhance the transparency of the description of the estimation method used for forest land remaining forest land by including in its next NIR a table reporting the annual area classified as forest land remaining forest land and the related biomass carbon stock per ha values used to estimate the annual carbon stock changes. Noting that the stock difference method needs to be applied to a constant area, the ERT recommends that Spain document the procedure adopted to implement data from the complete three NFIs in carbon stock change estimates, taking into account the timespan of the NFIs and the need for considering a constant area in the application of equation 2.8 of the 2006 IPCC Guidelines (vol. 4, chap. 2).</p>	Yes. Transparency
L.23	4.C.2.2 Cropland converted to	<p>The Party has reported on the use of a 20-year transition period for the living biomass pool for cropland converted to grassland in its NIR (table 6.1.9, p.443). During the review, the Party explained that a 20-year transition period has been assumed for the living biomass pool for cropland converted to grassland because the transition is not</p>	Not an issue/problem

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	grassland	<p>considered to be human induced, so a gradual transition in the biomass pool to a new equilibrium can be assumed, in line with the 2006 IPCC Guidelines (vol. 4, section 6.3.1). The conversion of cropland to grassland is a transition first identified in the 1990s owing to the progressive abandonment of croplands driven by the modernization of farming in Spain and the entry into force of CAP.</p> <p>The ERT noted that the information provided clarifies the issue and encourages the Party to explain in the NIR that a 20-year transition period has been assumed for the living biomass pool for cropland converted to grassland because the transition is not considered to be human induced, so a gradual transition in the biomass pool to a new equilibrium can be assumed, in line with the 2006 IPCC Guidelines (vol. 4, section 6.3.1) and that the conversion of cropland to grassland is a transition first identified in the 1990s owing to the progressive abandonment of croplands driven by the modernization of farming in Spain and the entry into force of CAP.</p>	
L.24	4.D.1 Wetlands remaining wetlands – CO <sub>2</sub>	<p>The Party reported in its NIR (section 6.5.1.2, p.488) that all emissions from wetlands remaining wetlands have been assigned to the flooded lands subcategory. The ERT noted, however, that in CRF table 4.D, the emissions for wetlands remaining wetlands are reported under the peat extraction remaining peat extraction subcategory. During the review, the Party explained that peat extraction is the only activity reported under the wetlands remaining wetlands category and that emissions are reported in CRF table 4.D under wetlands remaining wetlands – peat extraction remaining peat extraction. The Party acknowledged that an error occurred in the wording of the NIR and indicated that it will correct this in its next annual NIR submission.</p> <p>The ERT recommends that the Party enhance QC checks and ensure consistency between the information reported in CRF table 4.D and that reported in the NIR.</p>	Yes. Convention reporting adherence
Waste	5.A.1 Managed waste disposal sites – CH <sub>4</sub>	<p>The Party reported CH<sub>4</sub> recovery and flaring in managed solid waste disposal sites in table 5.A (e.g. 85.46 kt CH<sub>4</sub> for energy recovery in 2017). The ERT noted that the NIR includes information on the basis for the reporting of gas recovery quantities (pp.537–538). The ERT noted, however, that the NIR does not include information regarding on what the reporting of gas recovery quantities is based. During the review, the Party explained that the information provided in NIR table 7.2.5 regarding the AD of burned, captured and emitted CH<sub>4</sub> from landfills is included as a response to a specific request from the previous ERT. More detailed descriptions of AD methodology and emissions calculations for this category are provided in the corresponding methodological fact sheet referenced in the NIR (p.537). The Party also informed the ERT that CH<sub>4</sub> generation from the decomposition of waste deposited in managed landfills (5.A.1.a) is calculated according to the first-order decay model. For landfills identified as landfills with a biogas capture system, if no direct information is available on the amount of CH<sub>4</sub> captured, this is considered to be 20 per cent of the CH<sub>4</sub> generated (2006 IPCC Guidelines, vol. 5, chap. 3, p.3.19). If available, direct data on the amount of CH<sub>4</sub> captured are used, with a limit of a maximum capture rate of 70 per cent. Finally, direct data on CH<sub>4</sub> amounts flared or used for energy recovery are used if provided by the installations. Otherwise, if no direct information is available, 15 per cent of captured CH<sub>4</sub> is considered to be flared and 85 per cent consumed in engines. These figures are based on historical inventory data.</p> <p>The ERT recommends that the Party provide more detailed information in the NIR regarding the data sources of CH<sub>4</sub> recovered and flared for the entire time series, as well as data and explanatory information on the amount of recovered CH<sub>4</sub> that is estimated, calculated or measured.</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
W.8	5.D.1 Domestic wastewater – N <sub>2</sub> O	<p>The Party reported the F<sub>IND-COM</sub> value as 1.00 in the additional information table of CRF table 5.D for 1990–2017. However, the Party explained in the NIR (p.551) that the default value of 1.25 recommended in the 2006 IPCC Guidelines is used for F<sub>IND-COM</sub> (vol. 5, chap. 6, p.6.27). During the review, the inconsistency between the values shown in the NIR and CRF table 5.D was acknowledged by the Party. The Party explained that the F<sub>IND-COM</sub> value used in the calculations of N<sub>2</sub>O emissions from wastewater is 1.25, corresponding to the default value of the 2006 IPCC Guidelines. The value for F<sub>IND-COM</sub> reported in CRF table 5.D is not correct. The Party also explained that the reported value of 1.00 will be replaced by 1.25 in CRF table 5.D in the next submission.</p> <p>The ERT recommends that the Party ensure consistency between the value for F<sub>IND-COM</sub> provided in CRF table 5.D and in the NIR, and correct errors where necessary.</p>	Yes. Convention reporting adherence
KP-LULUCF activities			
KL.8	General (KP-LULUCF activities)	<p>The Party has reported that different data sources were used in land-use classification and for the assessment of areas subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in its NIR (section 11.2.3, p.675). The ERT noted that the different data sources used have different spatial resolutions and requested Spain to clarify whether and how data from NFIs have been used for land-use classification and for the assessment of areas subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.</p> <p>During the review, the Party explained that MFE50, developed for the plot sampling of the third NFI (see ID# L.17 in table 3) is one of the data sources used by Spain to classify land use. Spain explained that land use and land-use change have been assessed with a combination of two different types of sources:</p> <p>(a) Cartographic: CORINE land cover maps for 1990, 2000 and 2006; CORINE land cover maps for land-use change; MCA 1980–1990 and 2000–2010 editions; MFE50; and change layer in the MFE snapshot for 2009 and 2012;</p> <p>(b) Statistical: afforestation of farmland subsidized by CAP; AR of farmland without CAP subsidies, grasslands and other lands as part of the forestry policy; and the agricultural statistical yearbook.</p> <p>The methodology used to develop the land transition matrix reported in the NIR (section 6.1.3) can be summarized as follows:</p> <p>(a) Cartography procedure: a direct correspondence has been made between most CORINE land cover classes and UNFCCC land-use categories. MFE and MCA have been used for supplementary information for some CORINE land cover classes;</p> <p>(b) Statistical procedure: the results of the cartographic procedure have been complemented and adjusted with (1) a significance threshold established for transitions; (2) statistical information for lands subject to AR for 1990–2017 and to deforestation (specifically for forest land converted to cropland, wetlands and settlements) for 2006–2017; and (3) statistical information from the agricultural statistical yearbook for land-use areas for 1970–1990.</p> <p>As stated in NIR table 11.2.1, the land areas subject to AR annually are based on statistical information, while those subject to deforestation, FM and CM are based on interpolation or extrapolation of data obtained from cartographic sources, depending on the transition and period of the time series. The land areas (by province) subject to deforestation annually (since 2006) and to AR (for the whole time series) meet the area threshold</p>	Yes. Transparency

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
		<p>selected for Spain to define forest (1 ha). In addition, Spain informed the ERT that a project to update and improve cartographic data to implement IPCC approach 3 is being finalized.</p> <p>The ERT notes that MFE50 has been developed on the basis of the third NFI; the information provided in table 6.1.4 of the NIR refers to the maps for 1997–2006. The ERT, considering the need to assess the areas subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol for the reporting period 2013–2017, asked Spain to clarify whether and how MFE50 has been used to assess the areas subject to FM and whether MFE50 has also been used for AR and deforestation activity assessment.</p> <p>During the review, Spain explained that MFE50 has been used (together with MCA) as supplementary information in the cartographic procedure for (1) some CORINE land cover classes, in particular “243 – mainly agricultural land with major areas of natural vegetation”; “244 – farm and forestry systems” and “324 – transitional woodland-shrub”; and (2) for assigning a land-use category to the 1990 CORINE land cover class “334 – burned areas”, as shown in the correspondence matrix between CORINE land cover, MF50 and MCA categories and UNFCCC land-use categories (2018 NIR, chap. 6, appendix 6.1). Spain also explained that MFE50 has not been used for the assessment of AR events, since statistical information has been included to complement the cartographic procedure for this kind of event. However, MFE50 has been used to identify deforestation events for 1990–2005. Since 2006, deforestation events (specifically for forest land converted to cropland, wetlands and settlements) have been identified with <i>FotoFija</i> (the cartographic layer of MFE which identifies deforestation events for 2009 and 2012). Finally, Spain informed the ERT that the correspondence matrix between CORINE land cover, MFE50 and MCA categories and UNFCCC land-use categories was included in the 2018 NIR submission (appendix 6.1, section 6.1.1.7) but this information was removed in the 2019 NIR submission.</p> <p>The ERT recommends that the Party include a technical annex to or reference in the NIR where the full documentation on land classification assessment and the identification of areas subject to activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol are clearly reported. The ERT further recommends that Spain include in the technical annex the correspondence matrices between CORINE land cover, MF50 and MCA categories and UNFCCC land-use categories. The ERT further recommends that Spain update and improve cartographic data to implement IPCC approach 3 on the basis of the ongoing project.</p>	
KL.9	Deforestation – CO <sub>2</sub>	<p>The Party has reported that conversion from forest land to non-herbaceous grassland, previously classified as deforestation in the 2017 and 2018 submissions, has been considered as an impermanent land-use change in its NIR (section 11.1.3, p.671). The ERT noted that it is not clear whether the above-mentioned area has been considered by Spain as a temporarily unstocked area (and consequently classified as forest land remaining forest land) or an area that undergoes clear-cut harvest and a subsequent different use (i.e. grazing).</p> <p>During the review, the Party explained that forest land converted to non-herbaceous grassland, previously classified as deforestation, has been considered to be non-human induced and therefore reclassified as temporarily unstocked areas and consequently classified as forest land. This change was implemented in the 2018 submission following a review recommendation from the previous ERT. The ERT noted that the information provided clarifies the issue.</p>	Not a problem
KL.10	FM – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party has reported GHG estimates for FM under Article 3, paragraph 4, of the Kyoto Protocol in its NIR (table 11.3.3, p.681) and in CRF table 4(KP). The ERT noted that data reported in the NIR are different from the FM data</p>	Not a problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
KL.11	FM – CO <sub>2</sub>	<p>reported in the emissions and removals in the CRF table (e.g. in 2017, –28,084 Gg CO<sub>2</sub> eq in the NIR as opposed to –29,930 Gg CO<sub>2</sub> eq in the CRF table). During the review, the Party explained that emissions from FM and HWP are reported separately in NIR table 11.3.3 (–28,084 Gg CO<sub>2</sub> eq for FM and –1,846 Gg CO<sub>2</sub> eq for HWP, for a total of –29,930 Gg CO<sub>2</sub> eq, in 2017). The ERT noted that the information provided clarifies the issue and encourages the Party to include it in the NIR.</p> <p>The Party has reported CO<sub>2</sub> removals from FM under Article 3, paragraph 4, of the Kyoto Protocol in CRF table 4(KP-I)B.1. The ERT noted that CO<sub>2</sub> removals increased by 3,200–3,800 kt (13–15 per cent). During the review, the Party explained that the recalculation has been driven by the update of the carbon content in the living biomass pool for forest land remaining forest land and the update of the AD from FAOSTAT for HWP. Recalculations are explained in the NIR (sections 6.1.8, 6.2.6, 6.8.4 and 11.3.1.4 (2018 submission) and sections 6.1.8, 6.2.4, 6.8.4 and 11.3.1.4 (2019 submission)). During the review, Spain further explained that the recalculation in the 2018 submission was mainly driven by the implementation of the recommendation of the previous ERT (reallocation of temporarily unstocked area, resulting from forest conversion to non-herbaceous grassland and previously classified as deforestation, to forest land remaining forest land) and the update of wildfire AD for 2015. In the 2019 submission, recalculation was driven by the update of national values of biomass expansion factor multiplied by density, root to shoot ratio and wood carbon content and by the use of living biomass data, at the provincial level, from the fourth NFI, as reported in the NIR (section 6.2.4, p.465).</p> <p>The ERT noted that the information provided clarifies the issue.</p>	Not a problem
KL.12	CM – CO <sub>2</sub>	<p>The ERT noted that the explanations provided regarding the use of “NO” in CRF table 4(KP-I)B.2 for emissions from organic soils in cropland (see ID# KL.5 in table 3) did not provide sufficient information to support its use. During the review, the Party explained that, according to National Geographic Institute data, total organic soils in Spain amount to 6,247 ha, representing 0.01 per cent of the national land surface, that the natural vegetation of these histosols is heathland and that they are not cultivated in Spain.</p> <p>The ERT recommends that, in order to support the use of “NO” in CRF table 4(KP-I)B.2, the Party explain in the NIR that, according to National Geographic Institute data, total organic soils in Spain amount to 6,247 ha, representing 0.01 per cent of the national land surface, that the natural vegetation of these histosols is heathland and that they are not cultivated in Spain.</p>	Yes. Transparency
KL.13	Biomass burning – CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O	<p>The Party has reported GHG emissions from areas affected by fires from FM under Article 3, paragraph 4, of the Kyoto Protocol in CRF table 4(KP-II)4. The ERT noted a significant deviation of the AD (i.e. burned area) under FM used to estimate emissions from fires, when comparing the 2018 and 2017 submissions. The ERT also noted that lower EFs, for CH<sub>4</sub> and N<sub>2</sub>O, have been used in the 2019 and 2018 submissions compared with the 2017 submission.</p> <p>During the review, the Party explained that the recalculation for biomass burning emissions under FM occurred between the 2017 and the 2018 submissions; the main drivers for the recalculation are the reallocation under FM of temporarily unstocked areas, previously considered land converted from forest to non-herbaceous grassland and consequently classified as deforestation; this reallocation affected the emissions related to fires that occurred in woody vegetation in categories such as grassland, forest land and FM activity. Accordingly, the IEFs for CH<sub>4</sub> and N<sub>2</sub>O emissions are lower in FM since default CH<sub>4</sub> and N<sub>2</sub>O EFs for savannahs and grassland are lower than those</p>	Not a problem

ID#	Finding classification	Description of the finding with recommendation or encouragement	Is finding an issue and/or a problem? <sup>a</sup>
		<p>for the category extra tropical forest, as provided in the 2006 IPCC Guidelines (vol. 4, table 2.5). Information on recalculations is reported in the 2018 submission (NIR, sections 6.1.2, 6.2.6 and 6.4.6) and in the 2019 submission (NIR, section 6.1.3).</p> <p>The ERT noted that the information provided clarifies the issue.</p>	

<sup>a</sup> Recommendations made by the ERT during the review are related to issues as defined in para. 81 of the UNFCCC review guidelines, or problems as defined in para. 69 of the Article 8 review guidelines.



## **VI. Application of adjustments**

11. The ERT did not identify the need to apply any adjustments to the 2019 annual submission of Spain.

## **VII. Accounting quantities for activities under Article 3, paragraph 3, and, if any, activities under Article 3, paragraph 4, of the Kyoto Protocol**

12. Spain has elected commitment period accounting and therefore the issuance and cancellation of units for KP-LULUCF activities is not applicable to the 2019 review.

## **VIII. Questions of implementation**

13. No questions of implementation were identified by the ERT during the individual review of the Party's 2019 annual submission.

## Annex I

## Overview of greenhouse gas emissions and removals for Spain for submission year 2019 and data and information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, as submitted by Spain in its 2019 annual submission

1. Tables 1–4 provide an overview of total GHG emissions and removals as submitted by Spain.

Table 1  
Total greenhouse gas emissions for Spain, base year<sup>a</sup>–2017  
(kt CO<sub>2</sub> eq)

	<i>Total GHG emissions excluding indirect CO<sub>2</sub> emissions</i>		<i>Total GHG emissions including indirect CO<sub>2</sub> emissions<sup>b</sup></i>		<i>Land-use change (Article 3.7 bis as contained in the Doha Amendment)<sup>c</sup></i>	<i>KP-LULUCF activities (Article 3.3 of the Kyoto Protocol)<sup>d</sup></i>	<i>KP-LULUCF activities (Article 3.4 of the Kyoto Protocol)</i>	
	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>	<i>Total including LULUCF</i>	<i>Total excluding LULUCF</i>			<i>CM, GM, RV, WDR</i>	<i>FM</i>
FMRL								–23 100.00
Base year	255 371.44	291 246.85	NA	NA	NA		–95.02	
1990	252 617.07	288 492.48	NA	NA				
1995	294 036.49	328 614.07	NA	NA				
2000	348 004.89	387 527.93	NA	NA				
2010	320 257.27	357 676.78	NA	NA				
2011	319 929.16	357 344.00	NA	NA				
2012	315 211.78	350 671.71	NA	NA				
2013	289 025.36	323 441.20	NA	NA		–7 531.60	1 657.86	–28 226.95
2014	289 663.74	326 121.00	NA	NA		–7 236.96	65.92	–29 074.22
2015	298 871.97	337 598.74	NA	NA		–6 625.54	–2 130.73	–29 871.64
2016	288 154.19	326 383.41	NA	NA		–6 046.25	–2 757.60	–29 449.56
2017	301 903.06	340 230.88	NA	NA		–5 513.63	–3 016.73	–29 930.43

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.

<sup>a</sup> “Base year” refers to the base year under the Kyoto Protocol, which is 1990 for CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O and 1995 for HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub>. The base year for CM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Spain. For activities under Article 3, para. 3, of the Kyoto Protocol and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

<sup>c</sup> The value reported in this column refers to 1990.

<sup>d</sup> Activities under Article 3, para. 3, of the Kyoto Protocol, namely AR and deforestation.

Table 2

**Greenhouse gas emissions by gas for Spain, excluding land use, land-use change and forestry, 1990–2017**(kt CO<sub>2</sub> eq)

	<i>CO<sub>2</sub><sup>a</sup></i>	<i>CH<sub>4</sub></i>	<i>N<sub>2</sub>O</i>	<i>HFCs</i>	<i>PFCs</i>	<i>Unspecified mix of HFCs and PFCs</i>	<i>SF<sub>6</sub></i>	<i>NF<sub>3</sub></i>
1990	231 061.41	35 233.04	17 929.76	3 039.92	1 164.38	NO, NA	63.99	NO, NA
1995	267 226.78	37 197.30	17 167.34	5 867.64	1 055.21	NO, NA	99.81	NO, NA
2000	310 828.32	42 497.05	21 267.90	12 253.59	494.73	NO, NA	186.33	NO, NA
2010	283 108.54	40 322.24	17 835.71	16 070.28	105.10	NO, NA	234.89	NO, NE, NA
2011	284 041.30	40 571.33	16 910.10	15 368.22	89.96	123.95	239.15	NO, NE, NA
2012	278 645.64	39 549.59	16 363.49	15 352.58	54.35	486.06	220.00	NO, NE, NA
2013	251 972.75	38 430.13	16 858.73	15 245.58	67.15	652.99	213.86	NO, NA
2014	254 518.46	38 045.86	17 664.16	15 109.50	63.38	509.64	209.99	NO, NA
2015	271 099.75	39 428.13	17 834.14	8 440.53	92.85	481.99	221.35	NO, NA
2016	260 289.02	39 468.22	17 547.72	8 201.51	90.65	556.67	229.62	NO, NA
2017	274 427.20	40 013.50	18 277.63	6 309.32	127.77	849.85	225.60	NO, NA
<b>Per cent change 1990–2017</b>	<b>18.8</b>	<b>13.6</b>	<b>1.9</b>	<b>107.5</b>	<b>-89.0</b>	<b>NA</b>	<b>252.6</b>	<b>NA</b>

Note: Emissions/removals reported in the sector other (sector 6) are not included in the total GHG emissions.

<sup>a</sup> Spain did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table 3

**Greenhouse gas emissions by sector for Spain, 1990–2017**(kt CO<sub>2</sub> eq)

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
1990	213 171.91	29 707.10	36 302.76	-35 875.42	9 310.72	NA
1995	250 127.89	31 831.06	35 797.56	-34 577.58	10 857.57	NA
2000	289 880.95	41 860.88	43 259.24	-39 523.04	12 526.86	NA
2010	265 565.80	40 300.19	37 735.18	-37 419.51	14 075.61	NA
2011	268 373.54	37 392.67	36 963.62	-37 414.84	14 614.18	NA
2012	264 768.20	35 743.12	35 753.54	-35 459.94	14 406.85	NA
2013	238 989.40	34 600.18	35 848.19	-34 415.83	14 003.42	NA
2014	239 076.90	36 420.84	37 535.94	-36 457.26	13 087.32	NA
2015	254 438.34	31 002.09	38 257.92	-38 726.77	13 900.39	NA
2016	243 847.80	30 531.25	38 353.07	-38 229.21	13 651.29	NA

	<i>Energy</i>	<i>IPPU</i>	<i>Agriculture</i>	<i>LULUCF</i>	<i>Waste</i>	<i>Other</i>
2017	258 913.24	28 247.33	39 524.51	-38 327.81	13 545.80	NA
<b>Per cent change 1990–2017</b>	<b>21.5</b>	<b>-4.9</b>	<b>8.9</b>	<b>6.8</b>	<b>45.5</b>	<b>NA</b>

*Note:* The Party did not report emissions/removals in the sector other (sector 6).

Table 4

**Greenhouse gas emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol by activity, base year<sup>a</sup>–2017, for Spain**  
(kt CO<sub>2</sub> eq)

	<i>Article 3.7 bis as contained in the Doha Amendment<sup>b</sup></i>	<i>Activities under Article 3, paragraph 3, of the Kyoto Protocol</i>		<i>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol</i>				
	<i>Land-use change</i>	<i>AR</i>	<i>Deforestation</i>	<i>FM</i>	<i>CM</i>	<i>GM</i>	<i>RV</i>	<i>WDR</i>
FMRL				-23 100.00				
Technical correction				NO				
Base year	NA				-95.02	NA	NA	NA
2013		-8 172.47	640.87	-28 226.95	1 657.86	NA	NA	NA
2014		-7 875.09	638.13	-29 074.22	65.92	NA	NA	NA
2015		-7 260.39	634.85	-29 871.64	-2 130.73	NA	NA	NA
2016		-6 679.89	633.65	-29 449.56	-2 757.60	NA	NA	NA
2017		-6 146.76	633.12	-29 930.43	-3 016.73	NA	NA	NA
<b>Per cent change base year–2017</b>					<b>3074.8</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>

*Note:* Values in this table include emissions from land subject to natural disturbances, if applicable.

<sup>a</sup> The base year for CM under Article 3, para. 4, of the Kyoto Protocol is 1990 for Spain. For activities under Article 3, para. 3, of the Kyoto Protocol, and FM under Article 3, para. 4, only the inventory years of the commitment period must be reported.

<sup>b</sup> The value reported in this column refers to 1990.

2. Table 5 provides an overview of key relevant data from Spain's reporting under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 5

**Key relevant data for Spain under Article 3, paragraphs 3 and 4, of the Kyoto Protocol in the 2019 annual submission**

<i>Key parameters</i>	<i>Values</i>
Periodicity of accounting	(a) AR: commitment period accounting (b) Deforestation: commitment period accounting (c) FM: commitment period accounting (d) CM: commitment period accounting (e) GM: not elected (f) RV: not elected (g) WDR: not elected
Election of activities under Article 3, paragraph 4	CM
Election of application of provisions for natural disturbances	Yes, for AR and FM
3.5% of total base-year GHG emissions, excluding LULUCF	9 917.659 kt CO <sub>2</sub> eq (79 341.275 kt CO <sub>2</sub> eq for the duration of the commitment period)
Cancellation of AAUs, CERs and ERUs and/or issuance of RMUs in the national registry for:	
1. AR	NA
2. Deforestation	NA
3. FM	NA
4. CM	NA
5. GM	NA
6. RV	NA
7. WDR	NA

## Annex II

### Information to be included in the compilation and accounting database

Tables 1–5 include the information to be included in the compilation and accounting database for Spain. Data shown are from the original annual submission of the Party, including the latest revised estimates submitted, adjustments (if applicable) and the final data to be included in the compilation and accounting database.

Table 1

#### Information to be included in the compilation and accounting database for 2017, including on the commitment period reserve, for Spain

(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>CPR</b>	1 590 189 509	–	–	1 590 189 509
<b>Annex A emissions for 2017</b>	–	–	–	–
CO <sub>2</sub> <sup>a</sup>	274 427 201	–	–	274 427 201
CH <sub>4</sub>	40 013 499	–	–	40 013 499
N <sub>2</sub> O	18 277 634	–	–	18 277 634
HFCs	6 309 320	–	–	6 309 320
PFCs	127 771	–	–	127 771
Unspecified mix of HFCs and PFCs	849 854	–	–	849 854
SF <sub>6</sub>	225 596	–	–	225 596
NF <sub>3</sub>	NO, NA	–	–	NO, NA
<b>Total Annex A sources</b>	<b>340 230 876</b>	–	–	<b>340 230 876</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2017</b>	–	–	–	–
AR	–6 146 756	–	–	–6 146 756
Deforestation	633 122	–	–	633 122
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2017</b>	–	–	–	–
FM	–29 930 426	–	–	–29 930 426
CM	–3 016 725	–	–	–3 016 725
CM for the base year	–95 022	–	–	–95 022

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table 2

#### Information to be included in the compilation and accounting database for 2016 for Spain

(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions for 2016</b>	–	–	–	–
CO <sub>2</sub> <sup>a</sup>	260 289 016	–	–	260 289 016
CH <sub>4</sub>	39 468 225	–	–	39 468 225
N <sub>2</sub> O	17 547 720	–	–	17 547 720
HFCs	8 201 510	–	–	8 201 510
PFCs	90 650	–	–	90 650
Unspecified mix of HFCs and PFCs	556 667	–	–	556 667
SF <sub>6</sub>	229 620	–	–	229 620
NF <sub>3</sub>	NO, NA	–	–	NO, NA
<b>Total Annex A sources</b>	<b>326 383 407</b>	–	–	<b>326 383 407</b>

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2016</b>	–	–	–	–
AR	–6 679 892	–	–	–6 679 892
Deforestation	633 646	–	–	633 646
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2016</b>	–	–	–	–
FM	–29 449 562	–	–	–29 449 562
CM	–2 757 602	–	–	–2 757 602
CM for the base year	–95 022	–	–	–95 022

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table 3

**Information to be included in the compilation and accounting database for 2015 for Spain**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions for 2015</b>	–	–	–	–
CO <sub>2</sub> <sup>a</sup>	271 099 750	–	–	271 099 750
CH <sub>4</sub>	39 428 128	–	–	39 428 128
N <sub>2</sub> O	17 834 143	–	–	17 834 143
HFCs	8 440 532	–	–	8 440 532
PFCs	92 852	–	–	92 852
Unspecified mix of HFCs and PFCs	481 988	–	–	481 988
SF <sub>6</sub>	221 352	–	–	221 352
NF <sub>3</sub>	NO, NA	–	–	NO, NA
<b>Total Annex A sources</b>	<b>337 598 745</b>	–	–	<b>337 598 745</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2015</b>	–	–	–	–
AR	–7 260 390	–	–	–7 260 390
Deforestation	634 851	–	–	634 851
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2015</b>	–	–	–	–
FM	–29 871 639	–	–	–29 871 639
CM	–2 130 726	–	–	–2 130 726
CM for the base year	–95 022	–	–	–95 022

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table 4

**Information to be included in the compilation and accounting database for 2014 for Spain**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions for 2014</b>	–	–	–	–
CO <sub>2</sub> <sup>a</sup>	254 518 463	–	–	254 518 463
CH <sub>4</sub>	38 045 863	–	–	38 045 863
N <sub>2</sub> O	17 664 160	–	–	17 664 160
HFCs	15 109 503	–	–	15 109 503
PFCs	63 383	–	–	63 383
Unspecified mix of HFCs and PFCs	509 639	–	–	509 639
SF <sub>6</sub>	209 988	–	–	209 988
NF <sub>3</sub>	NO, NA	–	–	NO, NA
<b>Total Annex A sources</b>	<b>326 121 000</b>	–	–	<b>326 121 000</b>

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2014</b>	–	–	–	–
AR	–7 875 093	–	–	–7 875 093
Deforestation	638 133	–	–	638 133
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2014</b>	–	–	–	–
FM	–29 074 223	–	–	–29 074 223
CM	65 920	–	–	65 920
CM for the base year	–95 022	–	–	–95 022

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.

Table 5

**Information to be included in the compilation and accounting database for 2013 for Spain**(t CO<sub>2</sub> eq)

	<i>Original submission</i>	<i>Revised estimate</i>	<i>Adjustment</i>	<i>Final</i>
<b>Annex A emissions for 2013</b>	–	–	–	–
CO <sub>2</sub> <sup>a</sup>	251 972 753	–	–	251 972 753
CH <sub>4</sub>	38 430 126	–	–	38 430 126
N <sub>2</sub> O	16 858 735	–	–	16 858 735
HFCs	15 245 584	–	–	15 245 584
PFCs	67 154	–	–	67 154
Unspecified mix of HFCs and PFCs	652 986	–	–	652 986
SF <sub>6</sub>	213 858	–	–	213 858
NF <sub>3</sub>	NO, NA	–	–	NO, NA
<b>Total Annex A sources</b>	<b>323 441 196</b>	–	–	<b>323 441 196</b>
<b>Activities under Article 3, paragraph 3, of the Kyoto Protocol for 2013</b>	–	–	–	–
AR	–8 172 473	–	–	–8 172 473
Deforestation	640 871	–	–	640 871
<b>FM and elected activities under Article 3, paragraph 4, of the Kyoto Protocol for 2013</b>	–	–	–	–
FM	–28 226 949	–	–	–28 226 949
CM	1 657 863	–	–	1 657 863
CM for the base year	–95 022	–	–	–95 022

<sup>a</sup> The Party did not report indirect CO<sub>2</sub> emissions in CRF table 6.



## **Annex III**

### **Additional information to support findings in table 2 in this report**

#### **Missing categories that may affect completeness**

The categories for which methods are included in the 2006 IPCC Guidelines that were reported as “NE” or for which the ERT otherwise determined that there may be an issue with the completeness of reporting in the Party’s inventory are the following:

- (a) 4.C.1 carbon stock change in the soil pool under grassland remaining grassland (CO<sub>2</sub>) (see ID# L.11 in table 3 in this report);
- (b) 4.V biomass burning – biomass burning on cropland remaining cropland and grassland remaining grassland (CO<sub>2</sub>) (see ID# L.14 in table 3 in this report).

## Annex IV

### Reference documents

#### A. Reports of the Intergovernmental Panel on Climate Change

IPCC. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. S Eggleston, L Buendia, K Miwa, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl>.

IPCC. 2014. *2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Hayama, Japan: Institute for Global Environmental Strategies. Available at <http://www.ipcc-nggip.iges.or.jp/public/kpsg>.

IPCC. 2014. *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. T Hiraishi, T Krug, K Tanabe, et al. (eds.). Geneva: IPCC. Available at <http://www.ipcc-nggip.iges.or.jp/public/wetlands/>.

IPCC. 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*. E Calvo Buendia, S Guendehou, B Limmeechokchai, et al. (eds.). Geneva: IPCC. Available at <https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>.

#### B. UNFCCC documents

##### Annual review reports

Reports on the individual reviews of the 2013, 2014, 2015, 2016 and 2017 annual submissions of Spain, contained in documents FCCC/ARR/2013/ESP, FCCC/ARR/2014/ESP, FCCC/ARR/2015/ESP, FCCC/ARR/2016/ESP and FCCC/ARR/2017/ESP, respectively.

##### Other

Aggregate information on greenhouse gas emissions by sources and removals by sinks for Parties included in Annex I to the Convention. Note by the secretariat. Available at <https://unfccc.int/sites/default/files/resource/AGI%202019.pdf>.

Annual status report for Spain for 2019. Available at <http://unfccc.int/resource/docs/2019/asr/esp.pdf>.

Conclusions and recommendations from the 16<sup>th</sup> meeting of GHG inventory lead reviewers. Available at [https://unfccc.int/sites/default/files/resource/04\\_GHG-LRs-2019-conclusions\\_0.pdf](https://unfccc.int/sites/default/files/resource/04_GHG-LRs-2019-conclusions_0.pdf).

Report on the review of the report to facilitate the calculation of the assigned amount for the second commitment period of the Kyoto Protocol of Spain. FCCC/IRR/2016/ESP. Available at <https://unfccc.int/resource/docs/2017/irr/esp.pdf>.

#### C. Other documents used during the review

Responses to questions during the review were received from Martin Fernández Díez (Ministry for Ecologic Transition and the Demographic Challenge), including additional material on the methodology and assumptions used. The following references are reproduced as received:

Maria Luz Cayuela et al. 2017. Direct Nitrous oxide emissions in Mediterranean climate cropping systems: Emissions factor based on a meta-analysis of available measurement

data. Agriculture, Ecosystems & Environment, Volume 238, 1 February 2017, Pages 25-35  
<http://www.sciencedirect.com/science/article/pii/S0167880916304984>.

Edwards R, Hass H, Larivé J-F, et al. 2014. *Well-to-Wheels Report version 4.a : JEC Well-to-Wheels Analysis*. Joint Research Centre of the European Commission, EUCAR and CONCAWE. Available at <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/well-wheels-report-version-4a-jec-well-wheels-analysis>.

EEA. 2016. EMEP/EEA air pollutant emission inventory guidebook 2016. Luxembourg: Publications Office of the European Union. Available at <https://www.eea.europa.eu/publications/emep-eea-guidebook-2016>.

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